PURBANCHAL UNIVERSITY

2018

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG361CI: Design of Steel & Timber Structures *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

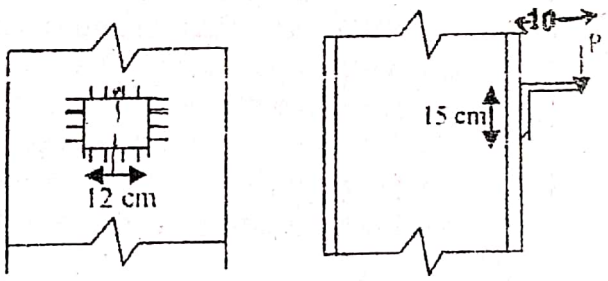
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Is 800-1984, IS 883-1970 and structural steel sections table are allowed for use. Assume any missing data but use 250MPa Steel unless otherwise specified.

Answer FIVE questions. **5×16=80**

1(a) Two plates 10 mm and 8mm thick are joined by triple riveted lap. Find the suitable pitch for the outer row of rivets if the pitch for central row of rivet is half of the pitch for outer rows. Take field rivets with power driven. Also calculate efficiency. 8

(b) Calculate the safe load P which the bracket as shown (in two different views) can carry. The weld size is 6 mm. 8



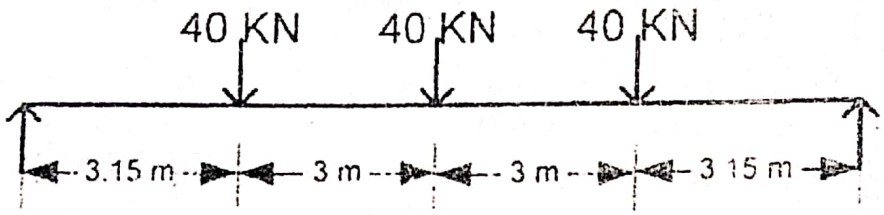
Bracket connection

2. A diagonal member of a roof truss carries a maximum axial pull of 300 KN. Design the section and the connection with a 14mm gusset plate. The length of a gusset plate available for making connection is 31cm. design the lug angle also if required. Take Fy=250MPa. 16

3. Design a compound column to carry an axial load of 1000 KN. The column is built up of two channels placed toe to toe and laced or battened together. The effective length is 6 m. Use 250 MPa steel. 16

Contd. ...

4. Design a main floor beam supporting three equidistance floor joists over a span of 12.3m as shown in fig. Each joist transmits 40KN on the main beam. 16



5(a) Design a sal boxcolumn using 50mm thick plank to carry axial load of 300KN and length 4.0m. 8

(b) Design a timber beam of length 4.0m supported on wall of 30cm thick carrying udl of 15KN/m. Use deodar timber. 8

6(a) Sketch the section of plate girder showing its elements. Explain the graphical method of curtailment for the flange plate of built-up beam. 2+6

(b) Determine the maximum wind pressures to be considered on a sloping roof from the following data: 8

basic wind speed = 47m/s, $K_1 = 1$, $K_2 = 1.0$, $K_3 = 1$, $C_{pi} = \pm 0.5$

C_{pe} : (i) when wind blows normal to the ridge,

for wind ward slope: -0.4

for lee-ward slope: -0.4

C_{pe} : (ii) when wind blows parallel to the ridge,

for both slopes for $1/4^{th}$, length of building: -0.7

for both slopes for middle half length of building: -0.6

Dhruv yadav. (PUSET)

PURBANCHAL UNIVERSITY

2017

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG361CI: Design of Steel & Timber Structures *(New Course)*

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All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Is 800-1984, IS 883-1970 and structural steel sections table are allowed for use. Assume any missing data but use 250MPa Steel unless otherwise specified.

Answer FIVE questions. **5×16=80**

1(a) Write down the advantages and disadvantages of welded joints. 6

(b) Design the riveted connection joining the bracket angles 2 ISA 100×100×8 mm with the column flange as shown in Fig. 1(b). If: (i) the rivets are power-driven (hot) shop rivets, (ii) the rivets are power-driven (cold) shop rivets. 10

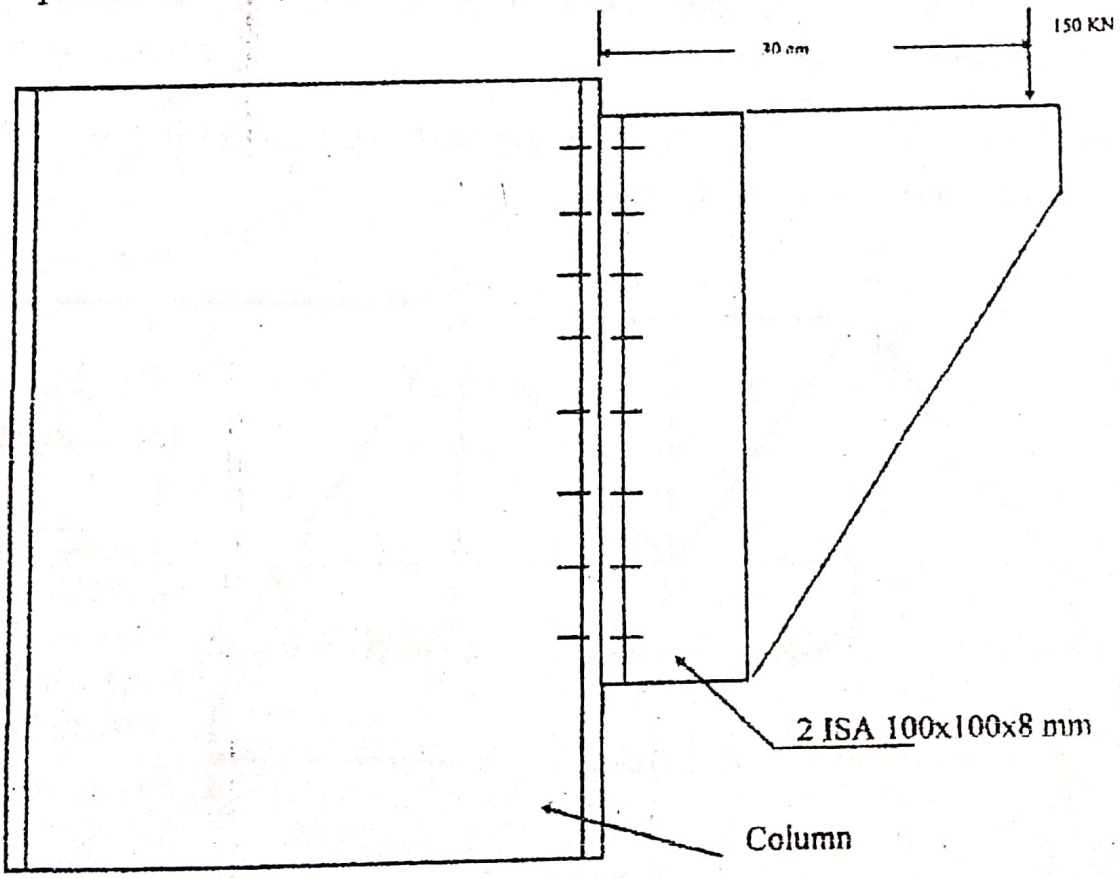

Fig. 1(b)

Contd. ...

2(a) Design a 2m long tension member subjected to a pull of 220 kN using two unequal angles placed back to back with their shorter legs connected on the same side of the gusset plate by 18mm dia. rivets. Use hand driven rivets at joints. 10

(b) A discontinuous strut 1.75m long consists of two equal angles ISA 50x50x6 mm. It is connected to the same side of gusset plates by two rivets on each angle at both ends. Calculate the load which this strut can carry if yield stress of steel is 250MPa. 6

3. A hall of clear dimensions 20m×8m is to be covered by RCC slab flooring 15cm thick resting over RS joists spaced at an interval of 4m centre to centre. Terrazzo finishing 2cm thick is to be provided over the RCC slab. The live load on the slab is 4 kN/m². The joists are resting over 30cm thick walls. Design the floor joists if the permissible stresses in bending and shear are I65MPa and 100 MPa respectively. The unit weight of RCC and finishing is 24 kN/m³. 16

4(a) Design the bolted joint and the members for joint 1 of a bridge truss as shown in Fig. 4(a). 8

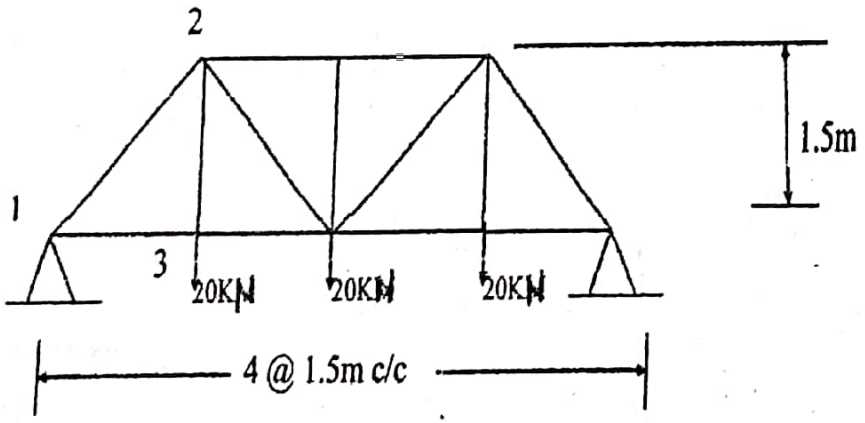

Fig. 4(a)

(b) Design a 5m long rectangular box columns built up by 5cm thick Deodar planks to carry an axial load of 500 kN. 8

Contd

5(a) A simply supported plate girder having a span of 14m has support floor beams that frame at 2m centre to centre as shov in Fig. 5(a). Each floor beam introduces a concentrated load 150 kN on the girder. In addition the girder has to carry uniformly distributed load of 20 kN/m including its own weig The top flange of the girder is to be restrained effectively and t girder provided with vertical stiffeners. Assuming that the dep of web plate is to be 100cm, find: (i) the suitable thickness of t web, and (ii) the section of the flange at the centre of the span.

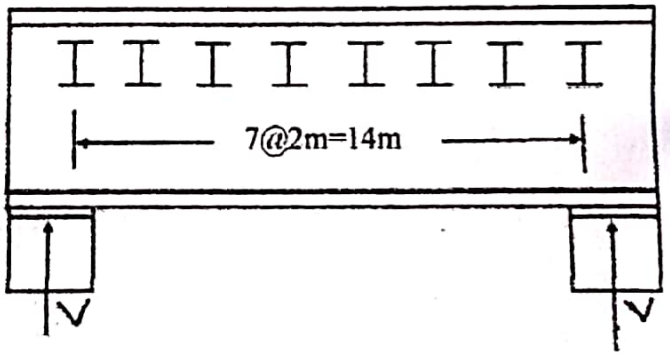

Fig. 5(a)

6. Design a built-up column carrying an axial load 1200 kN. length is 8m and it is effectively held in position at both ends restrained against rotation at one end. Assume a yield stres 250 MPa.

PURBANCHAL UNIVERSITY

2017

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Is 800-1984, IS 883-1970 and structural steel sections table are allowed for use. Assume any missing data but use 250MPa Steel unless otherwise specified.

Answer FIVE questions. **5×16=80**

1(a) Draw the stress-strain curve of mild steel with its various characteristics and states. Explain mechanical properties of mild steel. 2+4

(b) A double riveted double cover butt joint in a structure is used for connecting two plates of 12mm thick. The power driven field rivets of 20mm dia. are used. Suggest a suitable pitch of rivets and corresponding to the pitch selected, find the efficiency in the joint. 10

2(a) Design a tension member 3m long using two equal angle sections to carry 250KN. Angles are connected on both side of gusset plate by 16mm dia hand driven rivets and legs are tacked with rivets. 10

(b) What do you mean by curtailment of flange plate/cover plates in plate girder? Derive the relations for effective flange area and net tension flange area for the plate girder. 6

3(a) Write the design steps for the batten system of built-up column with neat sketches. 6

(b) Design base plate of a column section ISHB 350 subjected to an axial load of 1000KN and bending moment of 40KNm. Permissible stress in concrete is $4N/mm^2$. 10

Contd. ...

4. A hall of clear dimensions 15m×6.5m is provided with 12cm thick stone slabs over a rolled steel beams 3m c/c. A wearing coat of 2cm thick cement concrete is provided over 10cm thick lime concrete. The compression flange would be supported throughout its length by providing grooves in slabs. Design an intermediate beam with the following data. Live load=4KN/m^2, Unit weight of stone=24 kN/m^3 Unit weight of concrete= 24 kN/m^3, Unit weight of lime concrete=1 8 kN/m^3. 20

5(a) Design base plate of a column section ISHB 350 subjected to an axial load of 1100kN and bending moment of 60 kNm. The safe bearing pressure of concrete is 4N/mm^2. 10

(b) Design an angle Section purlin for a roof truss from the following data: 10

Span of roof= 12m, spacing of truss= 5m, spacing of purlin along slope of roof truss= 2m slope of roof truss= 1:2, wind load on roof surface=1000N/m^2

Vertical load from roof = 200N/m^2.

6(a) Derive an expression for economical depth of plate girder. 6

(b) A timber builtup column has to carry an axial load of 120 kN. Design the column for inside location use. 14

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG361CI: Design of Steel & Timber Structures *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Adopt suitably any missing data but use 250 MPa steel unless otherwise specified. IS 800-1984, IS 883-1994 and Steel section table book are allowed to use.

Answer FIVE questions. **5×16=80**

1(a) Describe different types of steel structure in brief. Explain merits and demerits of steel as structural material. 2+4

(b) Determine the wind pressure to be considered on a sloping roof from the following data: 10

- The basic wind speed is 47m/sec^2
- Span of the roof = 12m and pitch ¼
- Height of eaves above ground = 6 m
- Risk factor K_1= 1.0
- Terrain/height/structural size factor K_2 = 0.85
- Topographic factor K_3 =1

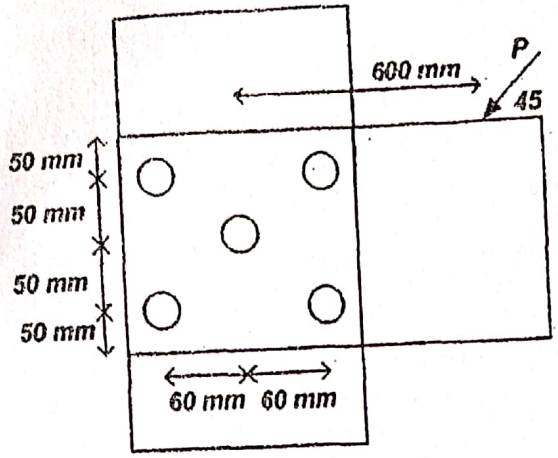
2(a) Explain the terms: Pitch, Edge, Distance, Gross Diameter and Gauge distance. 6

(b) Design an unequal angle section to act as a tie member 2m long in a roof truss if it is used to carry an axial load of 150 KN. Use power driven shop rivet. 10

3(a) A load is inclined at 45° to the horizontal with bracket as shown in figure below. 5-20mm diameter rivets are used and the plates connected are 12mm thick. Find the maximum value of load which can carry by the joint. 8

Contd. ...

Take $\tau_{vf} = 100MPa, \sigma_{pf} = 300MPa$



(b) A tie in a truss consists of two angles 90mm×60mm×10mm welded on either side of gussets plate 12mm thick through the longer legs. Design the welded joint if the permissible stress in angles and fillet welds are 150 MPa and 108 MPa respectively. 8

4(a) Design a built-up column with two channels placed back to back carrying an axial load of 1200KN. Its length is 8m and it is effectively held in position at both ends & restrained against rotation at one end. Assume steel to be mild steel. 12

(b) Derive the expression for economical depth of plate girder. 4

5. A hall of clear dimensions 12m×5m is to be covered by an RC slab flooring 10cm thick resting over RS joists spaced at an interval of 2.5m center to center. The live load of the slab is 3.5 KN/m². Design the floor joist supported by 30cm thick walls on both sides. Take allowable bending stress 165 MPa, shearing stress 100 MPa and unit weight of RC concrete is 25 KN/m³. 16

6(a) Find safe axial load for a sal wood column circular in section with 30cm diameter and length 3m. 6

(b) A timber beam having a clear span of 5m carries a UDL of 15KN/m excluding self weight of beam. Assume the beam to be made of Deodar wood. Design the beam. Assume 100mm bearing. 10

PURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG361CI: Design of Steel & Timber Structures

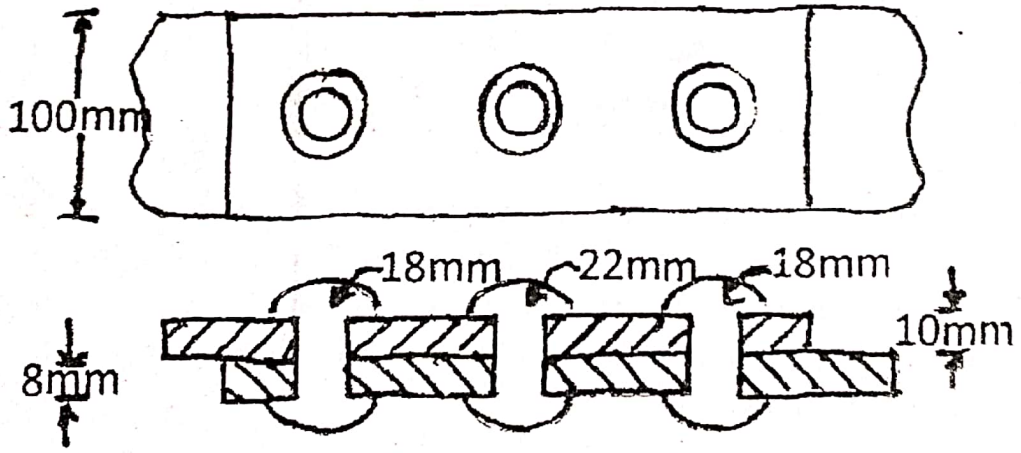
Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Adopt suitably any missing data. IS 800-1984, IS 883-1994 and Steel section table book are allowed to use.

Answer FIVE questions.

1(a) A triple riveted single lap joint is used for connecting two plates 100mm width having 10mm and 8mm thickness as shown in fig. in what way will the joint fail if allowable stress for plates=150MPa and rivets are power driven shop rivets, nominal dia. of rivets are as shown in fig. Also find the efficiency. 8



(b) A load of 150KN is applied to a bracket plate at an eccentricity of 300mm. 16 no.s of power driven rivets of 20mm dia, are arranged in two rows with 8 rivets per row. The rows are 200mm apart. The pitch of rivets in each vertical row is 80mm. Investigate the safety of the design. The thickness of the bracket plate is 12.5mm. 8

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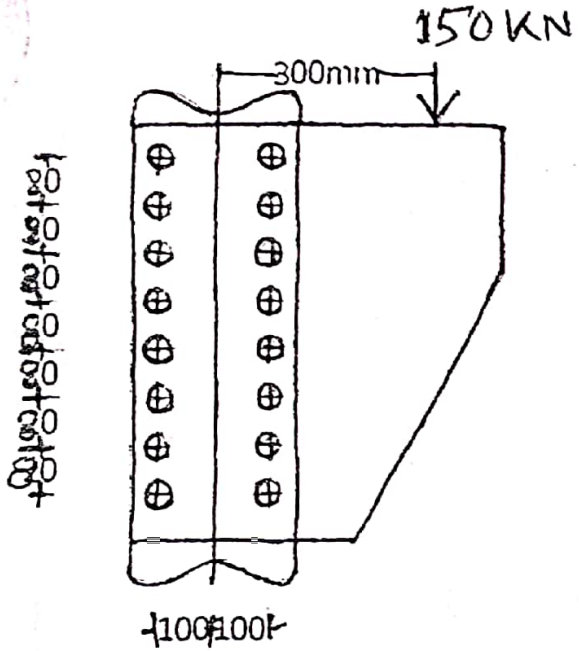


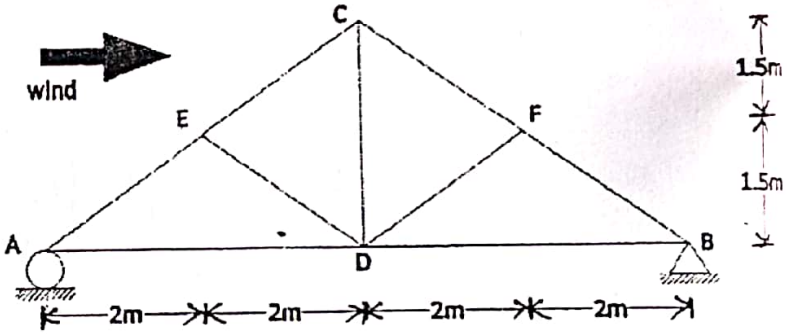
2. Design the tension member of a truss which carries a tensile force of 250KN, which shall consist of a T-section. The flange of the tee is connected to the gusset plate by fillet weld. Permissible tensile stress is 150MPa and permissible shear stress of fillet weld is 108MPa. 16

3. A column of 10m effective length has to support an axial load of 1000KN, Design the column, which shall consists of two channels placed back to back at a suitable spacing. Design also a single lacing system for the column. Yield stress of steel is 250MPa. 16

4. A hall 12m×8m has to be provided with a 125mm thick roof slab. The roof has also provided with 75mm thick lime concrete. The live load on the slab is 1500N/m². Design an intermediate steel beam, if beams are spaced at 3.25m centre. Also check the design. 16

Contd. ...

5. Calculate the most critical wind load at each top panel joint of the given truss. Show load value at each joint. Given data: Basic wind speed, V_b=50m/s, Risk coefficient, K_1=1, Terrain factor, K_2=0.85, Topographic factor, K_3=1. When wind blows normal to slope: External wind pressure coefficient C_{pe} = windward slope= -0.2, for inward slope= -0.5. When wind blows parallel to slope: External wind pressure coefficient= -0.5 internal wind pressure coefficient, C_{pi}= ±0.2



6(a) A timber having clear span 6.75m with 250mm bearing on each end at spacing of 75cm carries a UDL of 25KN/m including the self weight of the beam. Live load is 3KN/m². Assuming the beam to be made of Sissoo wood, design the beam. Check the design.

(b) Find the safe axial load on a circular sal column of diameter 25cm and length 3.55m

PURBANCHAL UNIVERSITY

2013

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG363CI: Design of Steel & Timber Structure

Candidates are required to give their answers in their own words as far as practicable.

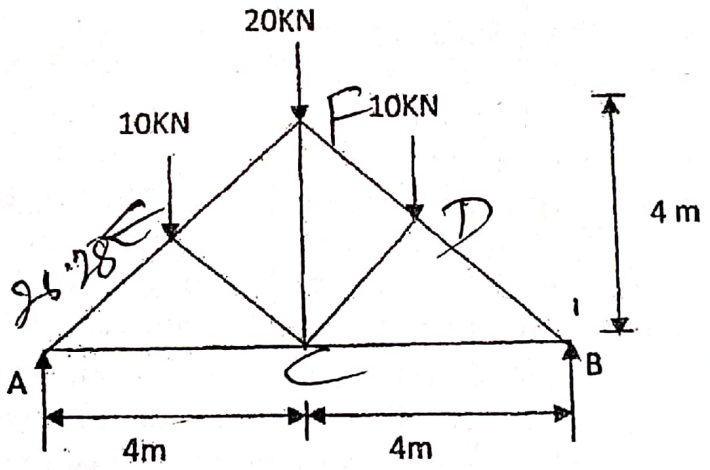
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Adopt suitably any missing data. IS 800-1984, IS 883-1970 and Steel Sections Book are allowed to use.

Answer FIVE questions.

1(a) How wind load is calculated in sloping roof truss? Explain. 6

(b) Design the members of the truss meeting at Joint A. 10



2(a) What are different types of failures in riveted joints? Explain. 4

(b) A tie in a truss consists of a pair of angles 80 × 80 × 10 mm welded on either sides of a gusset plate 12 mm thick through one leg. Design the welded joint if the permissible stress in angles and fillet welds are 150 MPa and 108 MPa respectively. 12

3(a) Design a riveted connection joining bracket angles double ISA (100 × 100 × 8mm) with the column flange as shown in fig 3(a). Use hot driven power rivets (initial tension). 8

Contd. ...

3(b) Calculate the strength of single ISA 40 × 25 × 6 mm thick angle section used as a tension member with long leg connected to gusset plate of 8 mm thickness by 14 mm diameter rivets. 8

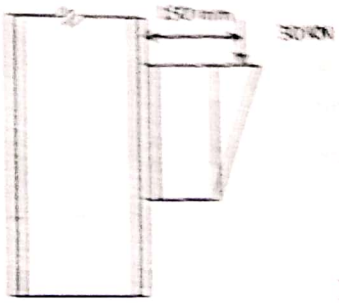


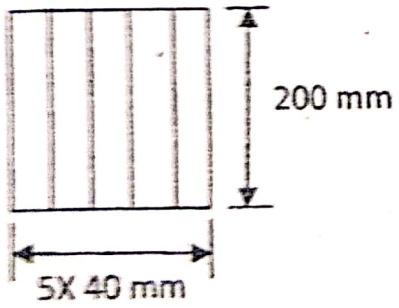
Fig. 3(a)

4(a) Write down steps for design of a column with lacings. 6

(b) Design a column section to carry a load of 300 KN at an eccentricity of 95 mm from the X-X axis. The effective length of column is 3.5 m. Use IS 226- 1975 steel. Take, C_{mx} =0.85. 10

5. A hall of clear dimensions 12m × 5m is to be covered by an RC slab flooring 10cm thick resting over RS joists spaced at an interval of 2.5 m centre to centre. The live load of the slab is 3.5 KN/m². Design the floor joist supported by 30 cm thick walls on both sides. Take allowable bending stress 165 MPa, shear stress 100 MPa and unit weight of RC concrete is 25 KN/m³. 16

6(a) Five planks 40mm × 200mm are glued together to form a solid column as shown below. If the length of the column is 3 m, find the load carrying capacity of the column. Take permissible compressive stress = 8 N/mm² and E = 8900 N/mm². 8



(b) Design a Sal Wood beam of effective span 5m. The beam carries a live load of 10 KN/m and dead load of 2.5 KN/m (including self weight). Take bearing length of 30cm on each side of the support. 8

PURBANCHAL UNIVERSITY
2012

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG363CI: Design of Steel & Timber Structure

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Adopt suitably any missing data. IS 800-1984, IS 883-1970 and Steel Sections Book are allowed to use.

Answer FOUR questions.

1(a) What are the advantages and disadvantages of Steel as a structural material? 6

(b) Calculate the safe load P which the bracket shown in Fig. 1(b) can carry. The size of weld is 6mm. 14

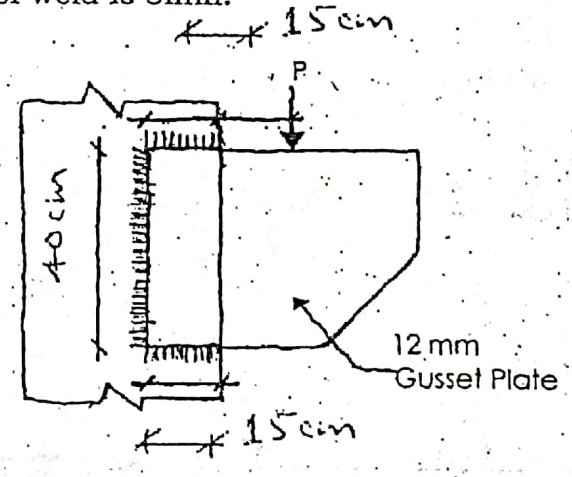

Fig. 1(b)

2(a) Design a T-section to act as a tension member carrying an axial tension of 200kN. 12

(b) Find the strength of a double reveted connection as shown in Fig. 2(b). Use power driven shop rivets. 8

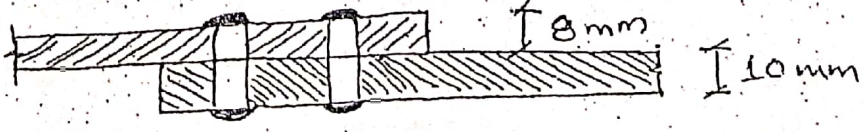

Fig. 2(b)

Contd. ...

3. Design a built-up column to carry an axial load of 1500 kN. The column is built-up of two channels placed back to back and laced together. The effective length of column is 6m. 20

4. A hall of clear dimension 12m×6m is to be covered by RCC slab resting on secondary beams spaced at 3m center to center. Design the secondary beam taking live load on slab 3 kN/m². Thickness of slab including floor finish is 200mm. The beams are resting over 30cm thick walls. The permissible stresses in bending and shear are 165 MPa and 100 MPa respectively. The unit weight of RCC and finishing is 24 kN/m³. 20

5(a) What are the components of a plate girder (only list them)? Discuss about the graphical method for the curtailment of the flange plates. 6

(b) Design the member including the joint connection meeting at joint D as shown in Fig. 5(b). Use angle section and 16mm pds rivets. 14

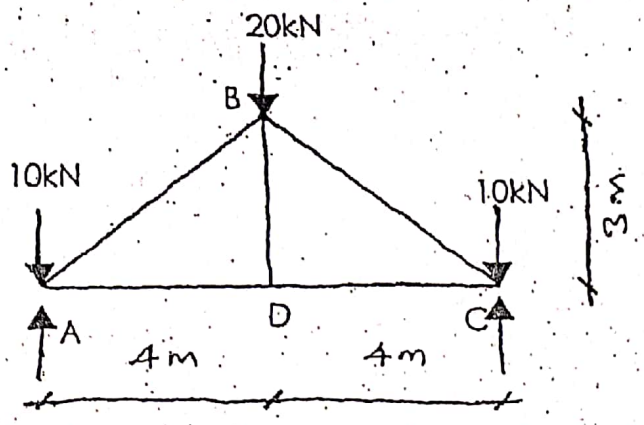

Fig. 5(b)

6(a) Design a teak timber beam of clear span 4m at a spacing of 50cm in a roof. The dead load of the covering is 2 kN and the live load is 2.5 kN/m². The bearing at each end is 10cm. 12

(b) Determine the safe axial load on a circular deodar column of diameter 15cm and 3m length. 8

PURBANCHAL UNIVERSITY
2018

B.E. (Civil)/Sixth Semester/*Final*
Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32
BEG364CI: Sanitary Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) What do you mean by dry weather flow and wet weather flow? Compare separate and combined sewerage system. 2+2+4

(b) A waste water sample is taken from a sewer. The 5-day BOD was found to be 180 mg/ℓ at 20°C which is 70% of the ultimate BOD. What will be the 4-day BOD of the waste water at 30°C? 8

2(a) What do you mean by BOD, COD and DO in wastewater? Explain the method of BOD test by dilution method. 1+1+1+5

(b) The sewer has a catchment area of 50 hectares. The classification of this surface area is as follows: 8

% of total area	Type of surfaces	Coefficient of run-off
25	pavements & yards	0.85
25	roof surfaces	0.80
15	barren land	0.30
25	garden and lawns	0.15
10	forests	0.10

Calculate the impervious facto., If the maximum intensity of rainfall is 50 mm/hr, Calculate the quantity of sewage for (i) separate system (ii) combined system. Take density of population is 300 person/ha and the rate of water supply is 150lpcd.

Contd. ...

3(a) What do you understand by sewage farming? Describes the methods of applying sewage on land. 2+6

(b) Find the minimum velocity and gradient required to transport coarse sand through a sewer of 1.5 m diameter. The average size of sand particles is 1 mm and specific gravity is 2.65. Assume K = 0.1, f = 0.03 and N = 0.013 and sewer is assumed to run half full flow. 8

4(a) Explain in brief; the construction working principle and design of oxidation pond. 8

(b) A stream saturated with DO has a flow of 1.2m^3/s, BOD of 4 mg/ℓ and rate constant of 0.3 per day. It receives an effluent discharge of 0.25 m^3/s having BOD 20 mg/ℓ, DO 5 mg/ℓ and rate constant 0.13 per day. The average velocity of flow of the stream is 0.18 m/s and depth of flow is 2.5m. Calculate DO deficit at point 20 km and 40 km downstream. Assume that temperature is 20°C throughout and BOD is measured at 5 days. Take saturation DO at 20°C as 9.17 mg/ℓ. 8

5(a) Explain the methods of solid waste disposal with their merits and demerits. 8

(b) Determine the size of a high-rate tricking filter for the following data: 8

(i) Sewage flow: 5MLD
(ii) Recirculation Ratio = 1.5
(iii) BOD of raw sewage = 250mg/ℓ
(iv) BOD removal in primary clarifier = 30%
(v) Final effluent BOD desired = 30mg/ℓ

6. Write short notes on any FOUR: 4×4=16

(a) Man holes
(b) Shape of sewers
(c) Self purification of stream
(d) Aerobic & Anaerobic decomposition
(e) VIP Latrine

Dhruv yadav. (PUSET)

PURBANCHAL UNIVERSITY
2017

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32

BEG364CI: Sanitary Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) What are the sources of sanitary sewage? Describe in detail the factors affecting quantity of sewage. 4+4

(b) An impervious area of 20 ha served by a sewer line. This area is subject to the three storms A, B, C with equal frequency of occurrence. The duration of three storms is 20 min, 30 min, 35 min respectively. Taking the time concentration equal to 30 min, determine the maximum runoff from the each storm. 8

2(a) Write about DO, BOD and COD with their significance. 8

(b) A town has FAR= 1.75 and area 542857.143 sqm with water supply rate 200 lpcd. Design a sewer running 0.7 times full at maximum discharge. Take N= 0.013 pf= 3, s= 0.2% (Hints: Take 9.5 sqm/person for forecasting). 8

3(a) Why manhole are used in sewer line? Describe about flushing tank and oil and grease removal. 8

(b) If water from Bishnumati River was tested for BOD at 20°C and the following observation was made: BOD_5= 280 mg/*l* and BOD_7= 319.88 mg/*l*. Determine the rate reaction constant? 8

4(a) A river having a flow of 5 m^3/s, BOD_5 1 mg/*l* and saturated with oxygen receives at a point A, a sewage effluent discharge of 2m^3/s with BOD_5 20 mg/*l* and DO 2 mg/*l*. A tributary meets the stream at a point B, 20 km on downstream, having a flow of 2m^3/s with BOD_5 2 mg/*l* and DO 9 mg/*l*. Compute the DO deficiency at point P 20 km downstream. Velocity of flow equal to 0.3 m/s and DO_{sat} at 20°C as 9.17 mg/*l* and k=0.12|d and R= 0.36|d. 8

Contd. ...

(b) What is meant by disposal of waste water by dilution? Write about factor affecting self-purification. 8

5(a) Design a low rate trickling filter to treat 6.0 MLD of sewage of BOD of 210 mg/l. The final effluent should be 30 mg/l and organic loading rate is 320 g/m^3/d. 8

(b) Describe about VIP latrine with neat sketch. Write about leaching cesspool. 8

4×4=16

6. Write short notes on any FOUR:
   (a) Activated sludge process
   (b) Partial flow Diagram
   (c) Determination of Settleable Solid
   (d) Incineration
   (e) Oxidation pond
   (f) DWF and WWF

PURBANCHAL UNIVERSITY
2017

B.E. (Civil)/Sixth Semester/*Final*
Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32
BEG364CI: Sanitary Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Name the various sewer appurtenances Explain manhole with a neat sketch. 8

(b) The catchment area of one of the town is 150 hectares. The classification of the data is as follows:

% of total area	Type of surfaces	Coefficient of run-off
20	hard pavements	0.85
15	roof surfaces	0.80
30	barren land	0.20
20	garden and lawns	0.20
15	forests	0.15

Calculate the impervious factor, if the maximum intensity of rainfall is 45 mm/hr. Calculate the quantity of sewage for (i) separate system (ii) combined system and (iii) partially combined system if the density of population is 300 person/ha and the rate of water supply is 150 lpcd. 8

2(a) Write about aerobic and anaerobic reactions of decomposition of sewage. 8

(b) For circular sewer and rectangular sewer to be hydraulically equivalent, find the relation between the depth of the rectangular sewer and diameter of circular sewer. Take width of rectangular sewer as 1.5 times the depth and assume that only three sides of the rectangular sewer are wetted. 8

Contd. ...

3(a) What is self purification? Describe the factors affecting self purification. 8

(b) If 2.5 ml of raw sewage has been diluted to 250 ml and DO concentration of the diluted sample at the beginning was 8.0 mg/ℓ and 5.4 mg/ℓ after 5 days of incubation at 20°C. Find 5 day BOD raw sewage and kg of 5-day BOD contained in million liters of sewage. 8

4(a) What is land treatment of sewage? What are the functions of oxidation pond? Write in detail with neat sketch. 8

(b) The sewage flows from a primary settling tank to a standard rate trickling filter at the rate of 5 MLD having BOD_5 of 150 mg/l. Determine the depth and volume of the filter, adopting a surface loading of 2500 l/m^2/day and organic loading of 165g/m^3/day. Also determine the efficiency of the filter unit. 8

5(a) Write about the methods of sludge treatment in brief. 8

(b) Design a septic tank and soak pit for a residential building having 20 people. The tank is to be cleaned once in two years. The sewerage flow is 100 l/min. Assume other data as per requirement. 8

6. Write short notes on any FOUR: 4×4=16

(a) Conservancy and water carriage system
(b) Sampling of sewage
(c) Suspended and attached growth process
(d) Composting
(e) Crown corrosion
(f) Sewage sickness and its prevention

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PURBANCHAL UNIVERSITY
2016

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32

BEG364CI: Sanitary Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) What are the different types of sewerage system? Explain the suitable condition for each type of systems. 2+6

(b) Calculate the diameter of combined and circular sewer with following data: 8

Rate of water supply: 100 *l*pcd
Population density= 100 person/ha
Peak factor= 2.7
Area= 35 ha
Rainfall intensity= 15mm/hr
Slope= 1 in 750
Rugosity coefficient= 0.011
Run off coefficient= 0.4

The sewer should run 0.6 times depth during peak flow.

2(a) Determine the quantity of sewage in m^3/s for combined system. 8

(i) 60% area with pavements (C_1=0.8)
(ii) 40% area with open ground (C_2= 0.3)
(iii) Area of community= 5 ha
(iv) Population density= 700 person/ha
(v) Water supply rate= 165 *l*pcd
(vi) Time of concentration= 10 minutes

Take peak factor= 3

(b) What is BOD and COD? Describe the significance of both. 4

(c) If BoD_5 at 30°C is 125 mg/l, what will be its BOD_5 at 20°C? 4

Contd. ...

3(a) With the help of neat sketches, describe the method of laying and their jointing during construction of sewers. 8

(b) A stream having flow of 1 cumec and BOD 4 mg/l is saturated with DO. It receives an effluent discharge of 0.25 cumec having BOD of 20 mg/l and DO of 4 mg/l. If the average velocity of flow is 0.15 m/sec. Calculate the DO deficit at points 20KM and 40KM downward. Assume temperature is 20°C throughout and BOD is measured at 5 days. Take rate constant for effluent and stream as 0.12 and 0.3 per day respectively. And saturation DO at 20°C is 9.17 mg/l. 8

4(a) What is an oxidation pond? How does it function? What information do you require for its design? 2+2+2

(b) What will be recirculation ratio required of a single stage filter having volume of 350m³. An effluent having maximum BOD concentration of 35 mg/l for a flow of sewage of 5 MLD having BOD of 180 mg/l. The PST removes 33% BOD. 10

5(a) Explain in detail various method of sludge disposal. 6

(b) Why it is necessary to dewater the sludge? 4

(c) Design a VIP latrine for 8 users. Assum0ing desluding period 3 years and digested sludge accumulation rate (R)= 0.04 m³/person/year. 6

6. Write short notes on ~~any~~ TWO: 4×4=16

(a) Man Holes

(b) Time of Concentration

(c) Self Purification of Stream

(d) Septic Tank

(e) Method of Solid Waste Disposal

(f) Aerobic and Anaerobic Decomposition

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32

BEG364CI: Sanitary Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Define the terms: Sewage, Sewer and Sewerage. Differentiate between separate and combined system of sewerage. 3+5

(b) Assuming the surface on which rainfall in a thickly build residential district having an area $200\times10^4 m^2$ as follows. 40% of area consisting of roofs and pavements having impermeability factor I as 0.85; 40% of the area consisting of lawns and garden having I=0.2 and 20% of area consisting of ground surface having I=0.1, calculate the coefficient of runoff. Calculate the quantity of storm sewage if the maximum intensity of rainfall is 40mm/hr. 8

2(a) If 3 days 25°C BOD of sewage sample is 200mg/l, what Will be its 5 days BOD at 30°C? 8

(b) A town has a population of 100,000 persons. Design a sewer running 0.7 times full at maximum discharge. Take a constant value of N=0.013 at all depths of flow. The sewer is to be laid at slope of 1 in 500. Take peaking factor of 3. Assume per capita water supply rate. 8

3(a) What is self-purification? Derive streeter-phelps equation. 2+5

(b) A town discharges 80 cumecs of sewage into a stream having a rate of flow of 1200 cumecs during lean days, at a 5 - day BOD of sewage of the given temperate is 250 mg/l. Find the amount of critical DO deficit and its location in the downstream portion of the stream. Assume deoxygenation coefficient as 0.1 and coefficient of self purification as 3.5. Assume saturation DO at given temperature as 9.2 mg/l. 9

Contd. ...

4(a) What is oxidation pond? Write its functions and uses. 7

(b) Calculate the effluent BOD of a two stage trickling filter with the following data: 9

Flow = 6000 m^3/day

BOD after primary treatment = 375 mg/l

Volume of filter 1 = 900 m^3

Volume of filter 2 = 450 m^3

Recirculation ratio for both filter = 1.5

5(a) With suitable example, explain the steps while designing the activated sludge process. 8

(b) Design a septic tank for an apartment having 200 people. The tank is to be cleaned once in two years. The sewerage flow is 432 *l*/min. Assume other data as per requirement. 8

6(a) Describe sanitary landfill, incineration and composting methods of solid waste disposal. 8

(b) Write short notes on any TWO: 4+4

(i) Sampling of sewage

(ii) Quantity of sanitary sewage

(iii) Sewage sickness

(iv) Manholes

PURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32

BEG364CI: Sanitary Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume any data if necessary.

Answer FIVE questions.

1(a) Compare between separate and combined system of sewerage system with their suitability in different conditions. Also, describe in what condition the partially combined system is suitable. 8

(b) Determine the storm water discharge from the catchment area of a city having 200 hectares. Assume that the surface on which the rain falls is classified as follows. The maximum intensity of rainfall is 40 mm/hr. 8

Types of surface	% area	Runoff coefficient
Vacant plots	40	0.15
Unpaved roads	10	0.40
Gardens and open spaces	20	0.15
Build up surfaces	30	0.90

It is expected that after 20 years the built up area will be 60% of the total area by converting additional 30% area of vacant plots. What will be the storm water discharge in this condition?

2 (a) Do you think there is any difference in the design approach of water mains and sewer lines. Give your reasons. What shapes of sewers do you prefer in different conditions, explain with their relative merits and demerits. 8

(b) A city discharges sewage at the rate of 1500 l/s, into a stream whose minimum flow is 7000 liters/sec., the temperature of both being 20°C . The 5 day BOD at 20°C for sewage is 165mg/I and that of river water is 2mg/I. The DO Content of sewage is zero while that of stream is 90% of the saturation DO. Find out the degree of treatment required if the minimum DO to be

Contd. ...

maintained in the stream is 4 mg/lit. Assume deoxygenation coefficient as 0.10 (base 10) and reoxygenation coefficient as 0.30 (base 10).

Given saturation DO at 20°C as 9.17 mg/lit 8

3(a) Explain the principle of biological treatment of waste water? List out the differences in characteristics of Standard rate filter and high rate filter? 8

(b) Design a conventional activated sludge plant to treat settled domestic sewage with diffused aeration system, for the following data 8

(i) Population 1,25,000

(ii) per Capita Sewage Contribution 175 lpcd

(iii) Settled sewage BOD_5 200 mg/lit.

(iv) Effluent BOD_5 required 15 mg/lit.

4(a) Describe the factors that effect theSludge digestion process and explain the process of anaerobic sludge digestion process 8

(b) Calculate the effluent BOD_5 of a two stage trickling filter with the following flows, BOD_5 and dimensions, using NRC formula: 8

$Q=5000 m^3/day$

BOD_5 = 280 mg/I

Volume of Primary filter = 1000 m3

Volume of secondary filter = 800 m3

Filter Depth = 2m

Re-circulation ratio for primary filter = 1.5

Re-circulation ratio for secondary filter = 1.25

5(a) Describe the various methods of disposal of excreta in unsewered area 8

(b) During BOD test conducted on a 5% dilution of waste, the following observations were taken. 8

(i) DO of aerated water used for dilution = 3.6 mg/I

(ii) DO of original sample 0.8 mg/I

(iii) DO of diluted sample after 5 day incubation =0.7 mg/I.

Compute : (a) 5 day BOD and (b) Ultimate BOD

Assume deoxygenation constant at test temperature as 0.12

6. Write short notes on any four of followings 4X4=16

(a) Time of Concentration

(b) Testing of sewer line

(c) Sewage sampling

(d) Drop Manhole

(e) Ventilation shaft

(f) Characteristics of Solid waste

PURBANCHAL UNIVERSITY

2013

B.E. (Civil)/Sixth Semester/Final

Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32

BEG362CI: Sanitary Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) What are the different types of sewerage systems? Explain the suitable conditions for each type of systems. 8

(b) A town discharges 80 cumecs of sewage into a stream having a rate of flow 1200 cumecs during lean days, at a 5 day BOD of sewage at a given temperature is 250mg/l . Find the amount of critical DO deficit and its location in the d/s portion of the stream. Assume deoxygenation coefficient K as 0.10 (base 10) and coefficient of self purification (fs) as 3.5. Assume saturation DO at given incubated for one day at 30°C has been found to be 120 mg/l. What will be the 5-day BOD. 8

2(a) What do you mean by BOD? Explain its significance in sanitary Engineering and also deduce an expression for BOD with time. 8

(b) The catchment area of a city is 750 hectares. Assuming the surface on which rain falls is classified as follows:

Types of surface	% area	Runoff coefficient
1. Forest area	10	0.15
2. Open ground + unpaved street	10	0.20
3. Parks +lawns + gardens	15	0.15
4. Gravel Road	20	0.25
5. Asphalt pavements	20	0.85
6. Water tight roof surfaces	25	0.90

Calculate the run off coefficient for the area and also the quantity of storm water, if time of entry is 15 minutes and time of flow is 10 minutes.

Contd. ...

3(a) What are the main objectives of treating sewage? What are the various processes required to remove the various types of sewage impurities? Draw a neat sketch showing the typical layout of a sewage treatment plant. 8

(b) Design sewer in separate system for a town with population of 100,000 and rate of water supply is 180 lpcd. The permissible sewer slope is 1 in 1000 and n = 0.012. Assume DWF is one third of maximum discharge. Check the velocity also. 8

4(a) Why is it necessary to treat the sewage sludge? What is the process of anaerobic sludge digestion? Describe the factors affecting sludge digestion. 8

(b) A single stage trickling filter receives sewage flow of 4 million liters per day containing raw sewage BOD of 300mg/lit. A primary settling tank is provided whose efficiency is 35%. Determine the recirculation ratio required to meet the maximum effluent BOD concentration of 60 mg/lit? The effective volume of filter is 300 m^3. 8

5(a) Under what circumstances septic tanks are most suitable? With the help of sketches, describe the construction and operation of a septic tank. 8

(b) Design a conventional activated sludge treatment plant to treat settled domestic sewage with diffused air aeration system for the following data: Population 150,000, sewage flow = 150 lpcd, settled sewage 5 -day BOD 200mg/l, F/M ratio = 0.30, concentration of microorganisms (MLSS) = 200 mg/lit. 8

6. Write short notes on any FOUR: 4×4=16

(a) Ventilating shaft
(b) Bio-filters
(c) Sewage sampling
(d) Drop manhole
(e) Oxygen sag curve
(f) Type and characteristics of solid waste

PURBANCHAL UNIVERSITY
2012

B.E. (Civil)/Sixth Semester/Final
Time: 03:00 hrs. Full Marks: 80/Pass Marks: 32
BEG362CI: Sanitary Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Explain the conservancy and water-carriage system of sanitation with merits and demerits of each method. Do you prefer combined swarage system in your city? Justify? 6+2

(b) A sewer line drains a residential area with average impervious factors c=0.35 .The distance of flow from the most remote part is 60m over ordinary grass with a slope of 4 percent. The area drained is 100,000m² and the intensity duration formula is i=5230/(t+30) mm/hr. Estimate the quantity of storm water. 8

2(a) A town has a population of 100000 person with a per capita water supply of 200 liters/day. Assuming 80% of the water supply find its way to the sewer, design a sewer running 0.75 times full at maximum discharge. Take a constant value of N=0.013 at all depths of flow. The sewer is to be laid at a slope of 1 in 600. 10

(b) Write short notes on any TWO (with sketches): 3+3

(i) Street inlets
(ii) Drop manholes
(iii) Requirements of sewer materials

3(a) The BOD exerted of a sewage sample incubated at 30°C for two days is found to be 220 mg/lit.

(i) Calculate the ultimate BOD.
(ii) What would be the BOD remained after 5 days if the test were run at 20°C?

(Assume k= 0.12 per day [base 10] at 20°C)

Contd. ...

(b) What do you understand by self-purification property of a stream? Explain the factors affecting this property. 8

4(a) How sampling of sewage is done? Describe. 4

(b) Determine the size of a high rate trickling filter for the following data: 12

Flow= 4.5 million litre per day. 4.5×10^6
Recirculation Ratio= 1:4 (for both stages)
BOD of raw sewage= 250 mg/L
BOD removed in primary clarifier= 25%
Final effluent BOD desired= 50 mg/L
Organic loading of filters= 10,000 kg/ha m/day (for both stages)

Also calculate the size of a standard rate trickling filter to accomplish the above requirement (data added).

5(a) Explain in brief the working principles and design of oxidation pond. 6

(b) What do you understand by digestion of sludge? Differentiate between aerobic and anaerobic digestion. 4

(c) What are different methods of final disposal of sludge? Explain in brief. 6

6(a) Show with sketch the basic elements of VIP latrine. How effluent of septic tank is disposed? 3+5

(b) Write short notes on any TWO: 4+4

(a) Composting
(b) Sanitary lands fills
(c) Attached growth process

PURBANCHAL UNIVERSITY

2018

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG365CI: Transportation Engineering-II *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Normal graph paper should be provided. Assume suitable data if necessary.

Answer FIVE questions. 5×16=80

1(a) Describe vehicle kinematics and scope of traffic engineering. 4+4

(b) The following speed data were collected during a two minute segment of a spot speed study in kmph. 8

92, 82, 78, 86, 100, 91, 63, 75, 86, 90, 88, 79, 95, 84.

(a) Estimate: (i) time mean speed

(ii) space mean speed

(b) What will be the average density of the above traffic stream of the mean headway is 8.6 sec.

2(a) Why is the origin and destination study carried out? How is O & D study data collected? 4+4

(b) The 15 minute traffic counts on cross roads A and B during peak hour are observed as 190 and 145 vehicle per lane respectively. If the amber times required are 3 and 2 seconds for road A and B, design the signal timing by trial cycle method. Assume average time headway of 3 sec during green phase. 8

3(a) Explain flexible and rigid pavements and bring out the points of difference. 8

(b) A road pavement is to be designed for a stretch of road with the following pavement layers:

(i) Minimum thickness of asphalt concrete on the surface course = 50 mm.

(ii) Well graded crushed stone aggregate for base course, CBR value = 90%

(iii) Fairly graded graved for sub-base course, CBR Value= 40%

(iv) Compacted Soil, CBR value= 10%

(v) 90° percentile sub grade CBR Value = 4%

Contd. ...

The road has single lane carriage way & caters present ADT of 1400 commercial vehicle per day with annual growth of 6.5%. The pavement is to be designed for 10 years period. Design the pavement section using IRC recommendation for CBR method. The road is to be compacted with 6 months from initial traffic count (CBR design curve attached here with). 8

4(a) Classify the penetration or grouted macadam? Write down the construction procedure of otta seal in the context of Nepal. 2+6

(b) Explain the typical flexible pavement failures with neat sketches. 8

5(a) What are the characteristics of an ideal bridge? 8

(b) Explain the activities and techniques used in road construction with suitable examples. 8

6. Write short notes on any FOUR: 4×4=16

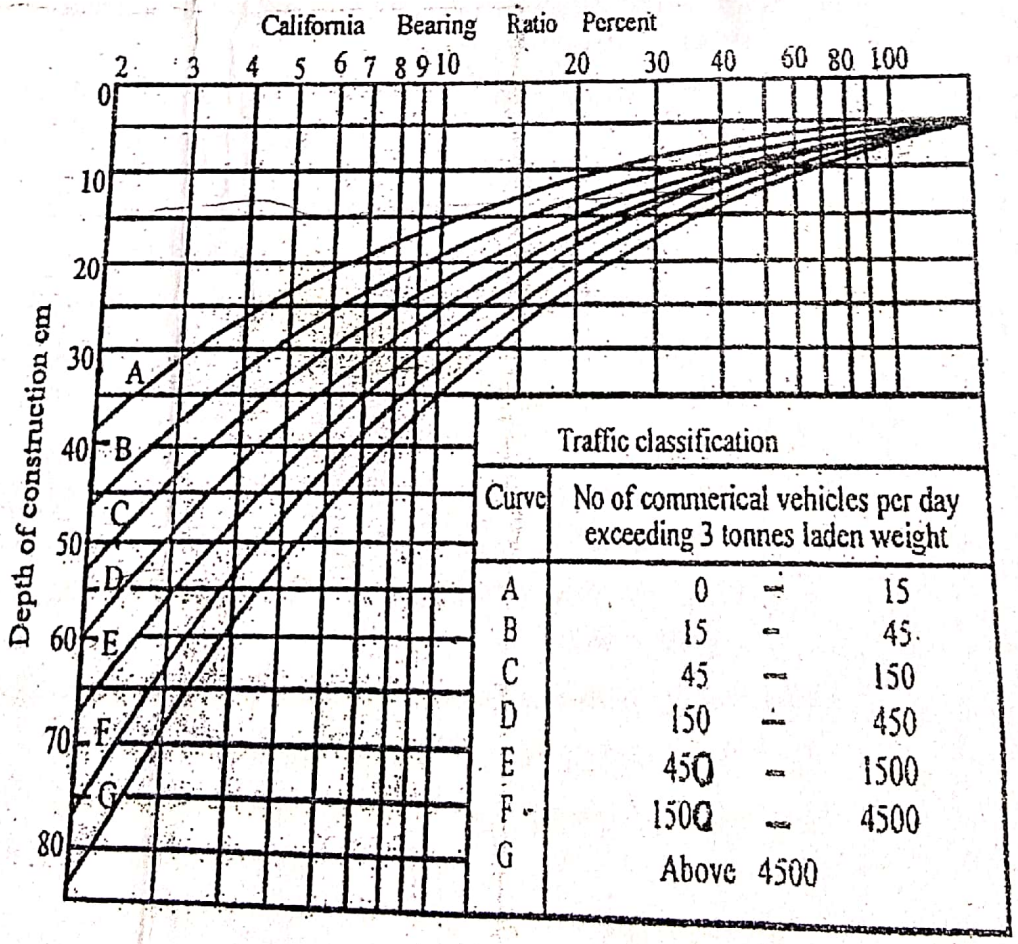
(a) Overpass

(b) Mud pumping

(c) Factor influencing night visibility

(d) Temperature stresses in rigid pavement

(e) Parking studies



Traffic classification

Curve	No of commerical vehicles per day exceeding 3 tonnes laden weight
A	0 – 15
B	15 – 45
C	45 – 150
D	150 – 450
E	450 – 1500
F	1500 – 4500
G	Above 4500

Dhrub yadav. (PUSET)

PURBANCHAL UNIVERSITY
2017

B.E. (Civil)/Sixth Semester/*Final*
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG365CI: Transportation Engineering-II *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Normal graph paper should be provided. Assume suitable data if necessary.

Answer FIVE questions. 5×16=80

1(a) What are the major vehicle characteristics? Describe their importance for traffic performance and highway design. 3+5

(b) A braking test was done for a truck traveling at the speed of 90 kmph. The truck was moving downwards on the road of 3° slope to horizontal and braking efficiency is 85% only. After application of brakes, a skid mark was seen as 38m in length. Determine the average skid resistance of the pavement. 8

2(a) What are the basic traffic flow parameters? What is the fundamental relationship to represent the traffic flow theory? Make sketches showing q-v-k relationships. 3+3+4

(b) Mention origin and destination studies. 6

3(a) The average normal flow of traffic on cross roads A and B during design period are 500 and 400 PCU per hour. The saturation flow values are estimated as 1500 and 1250 per hour respectively. The all red time required for pedestrian crossing is 10 secs. Design two phase traffic signal by Webster's method. 10

(b) How is dust controlled and ventilation achieved in tunneling? Explain. 6

4(a) Design a flexible pavement by CBR method recommended by IRC, using following data: 10
CBR value of sub-grade soil= 5%
Poorly graded gravel with CBR= 12%
Well graded gravel with CBR= 90%

Contd. ...

Minimum thickness of bituminous concrete surfacing may be taken as 5cm.

The present traffic volume= 800 commercial vehicles per day and growth rate is 7%. Take construction period of pavement as 12 months with 12 years of life period.

(b) Write down the different types of joints in rigid pavements. What are the requirements of joints? 6

5(a) Describe the construction procedure of bituminous pavement (asphalt concrete) including the properties of materials, construction steps, plants and equipments and the tests used for quality control. 10

(b) Illustrate the factors to choice the location of bridge site. Also, explain the classification of bridge. 8

6(a) List out the typical failures in flexible pavement with necessary sketches. 8

(b) What is the importance of road lighting? Describe the factors affecting night visibility. 8

7. Write short notes on any FOUR: 4×4=16

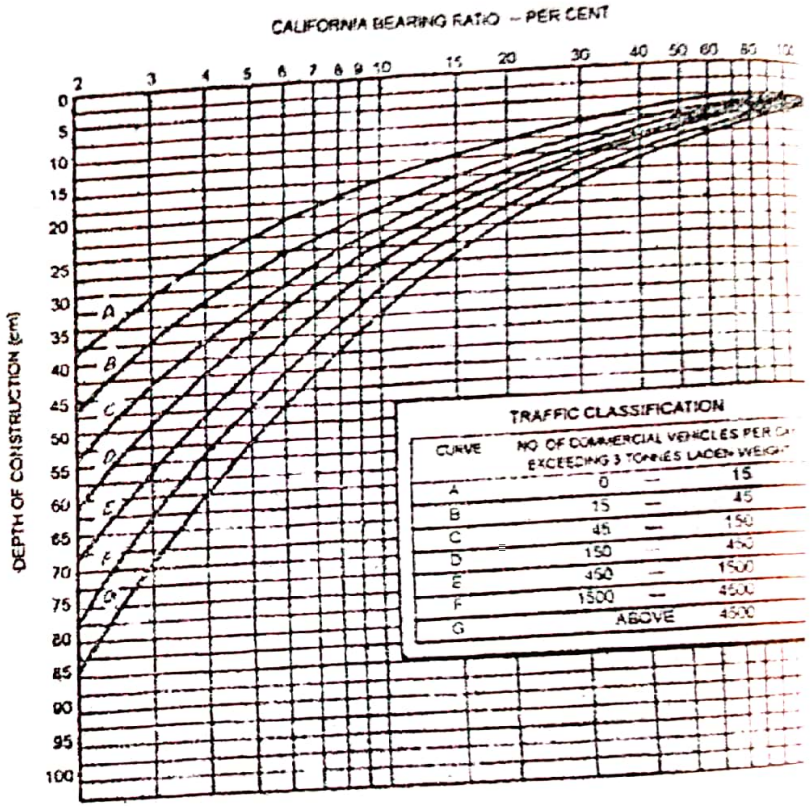
(a) Prime coat

(b) Rotary intersection

(c) Parking studies

(d) Soil stabilization

(e) Classification of highway maintenance work



TRAFFIC CLASSIFICATION

CURVE	NO OF COMMERCIAL VEHICLES PER DAY EXCEEDING 3 TONNES LADEN WEIGHT		
A	0	—	15
B	15	—	45
C	45	—	150
D	150	—	450
E	450	—	1500
F	1500	—	4500
G	ABOVE		4500

PURBANCHAL UNIVERSITY
2017

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG365CI: Transportation Engineering-II *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Normal graph paper should be provided. Assume suitable data if necessary.

Answer FIVE questions. **5×16=80**

1(a) Define traffic engineering. Describe in brief about traffic characteristics. 4+4

(b) A vehicle hits a bridge abutment at a speed estimated by investigations as 20kmph. Skid marks of 30m on pavement (f=0.35) followed by skid marks of 60m on the gravel shoulder approaching the abutment (f=0.50).What was the initial speed of the vehicle? 8

2(a) What are the purpose of origin destination study? What are different methods of collecting origin destination data? 4+4

(b) Compute the time means speed and space mean speed from the following data and verify their relation. 3+3+2

Vehicle No	Distance (m)	Travel Time(s)
1	200	18:00
2	200	20:00
3	200	22:00
4	200	19:00
5	200	20:00

3(a) Explain condition and collision diagram. Discuss about the advantages and disadvantages of rotary intersection. 8

(b) An isolated signal with pedestrian's indication is to be installed on a right angles intersection with road P of 12m wide and road Q of 9.6m wide. The heaviest volume per hour for each lane of road P and Q are 450 & 300 respectively. The approach speeds are 60 & 45 Kmph, for P and Q roads respectively. Design the timings of traffic and pedestrians signals? Assume suitable data if necessary. 8

4(a) What are the factors influencing the night visibility. 4

Contd. ...

(b) A road pavement is to be designed for a stretch of road with the following pavement layers: 12

(i) Minimum thickness of asphalt concrete on the surface course=50mm

(ii) Well graded crushed stone aggregate for base course, CBR value=90%

(iii) Fairly graded gravel for sub-base course, CBR value=20%

(iv) Compacted soil, CBR value=10%

(v) 90th percentile sub grade CBR value=4%

The road has single lane carriage way and caters present ADT of 1200 commercial vehicle per day with annual growth of 6%. The pavement is to be designed for 10 years period. Design the pavement section using IRC recommendation for CBR method. The road is to be compacted with 6 months from initial traffic count (CBR design curve attached herewith).

5(a) Describe the construction procedures of Water Bound Macadam (WBM). 8

(b) What do you mean by tunnel linning. Explain briefly. 8

6. Write short notes on any FOUR: 4×4=16

(a) Factor causing road accidents

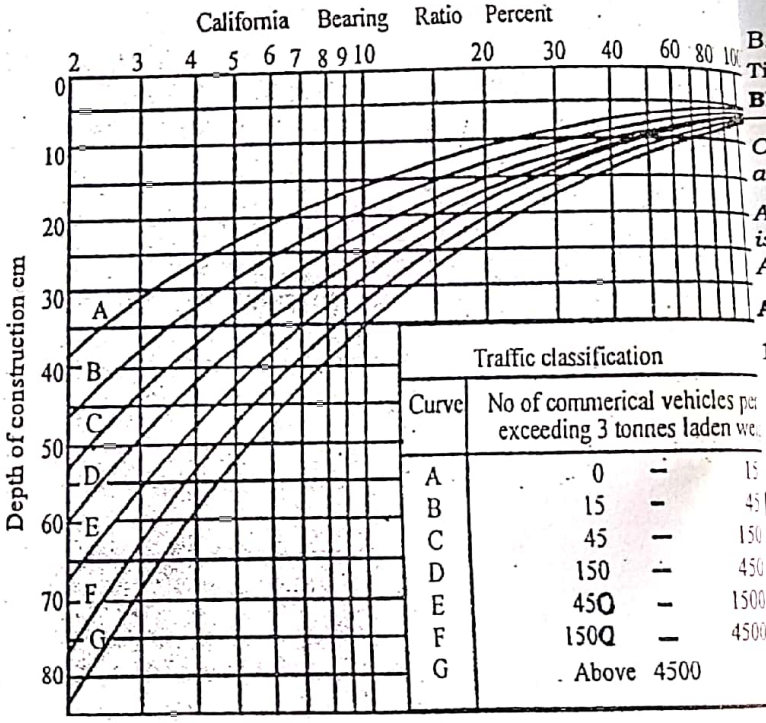
(b) Traffic islands

(c) Types of pavement

(d) Otta seal

(e) Classification of road maintenance

(f) Objectives of river training works



Traffic classification

Curve	No of commerical vehicles per day exceeding 3 tonnes laden weight
A	0 – 15
B	15 – 45
C	45 – 150
D	150 – 450
E	450 – 1500
F	1500 – 4500
G	Above 4500

PURBANCHAL UNIVERSITY
2016

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG365CI: Transportation Engineering-II *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Normal graph paper should be provided. Assume suitable data if necessary.

Answer FIVE questions. **5×16=80**

1(a) List scope of traffic engineering. Explain briefly about traffic characteristics. 4+4

(b) Spot speed studies were carried out at a certain stretch of a highway and the consolidated data collected are given below:

Speed range (Kmph)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of vehicles observed	12	18	68	89	204	256	119	43	33	9

Determine: (i) Upper speed limit for regulation, (ii) Lower speed limit for regulation, (iii) Speed to check design elements (iv) Modal speed. 8

2(a) Explain the design procedure of rotary intersection. What are advantages of rotary intersection? 6+2

(b) The average normal flow of traffic on the cross roads 1 and 2 during design period are 350 and 250 PCU/hr. The saturation flow values on these roads are estimated as 1200 and 900 PCU/hr respectively. The all red time required for pedestrian crossing is 10 sec. Design two phase signal by Webster's method. Take amber time of 2 sec on each phase for clearance. 8

3(a) Discuss the different types of joints considered in rigid pavement design. 6

(b) A road pavement is to be designed for a stretch of road with following pavement layers:

(i) Minimum thickness of asphalt concrete on surface course.

Contd. ...

(ii) Well graded crushed stone aggregate for base course CBR value= 90%.

(iii) Fairly graded gravel for sub base course, CBR value= 20%.

(iv) Compacted soil, CBR value= 10%.

(v) 90th percentile subgrade CBR value= 4%.

The road has single lane carriage way and caters present ADT of 1200 commercial vehicle for day with annual growth of 6%. The pavement is designed per 10 years. Design the pavement section using IRC recommendation for CBR method. The road is to be compacted with 6 months from initial traffic count. (CBR design curve attached herewith). 10

4(a) Define road construction technology. Write down the characteristics of mass haul diagram. 2+6

(b) Describe the construction of Otta seal roads including the requirements on materials, plants and equipments construction steps, and the tests for quality control. 8

5(a) Discuss the different types of failures occur in rigid pavement. Explain the maintenance of the WBM road. 4+4

(b) Define tunnel lining. Describe the method of tunneling in firm ground. 2+6

6. Write short notes on any FOUR: 4×4=16

(a) O & D Study

(b) Traffic signs and road marking

(c) Importance of street lightining

(d) River training work

(e) Characteristics of Ideal bridge

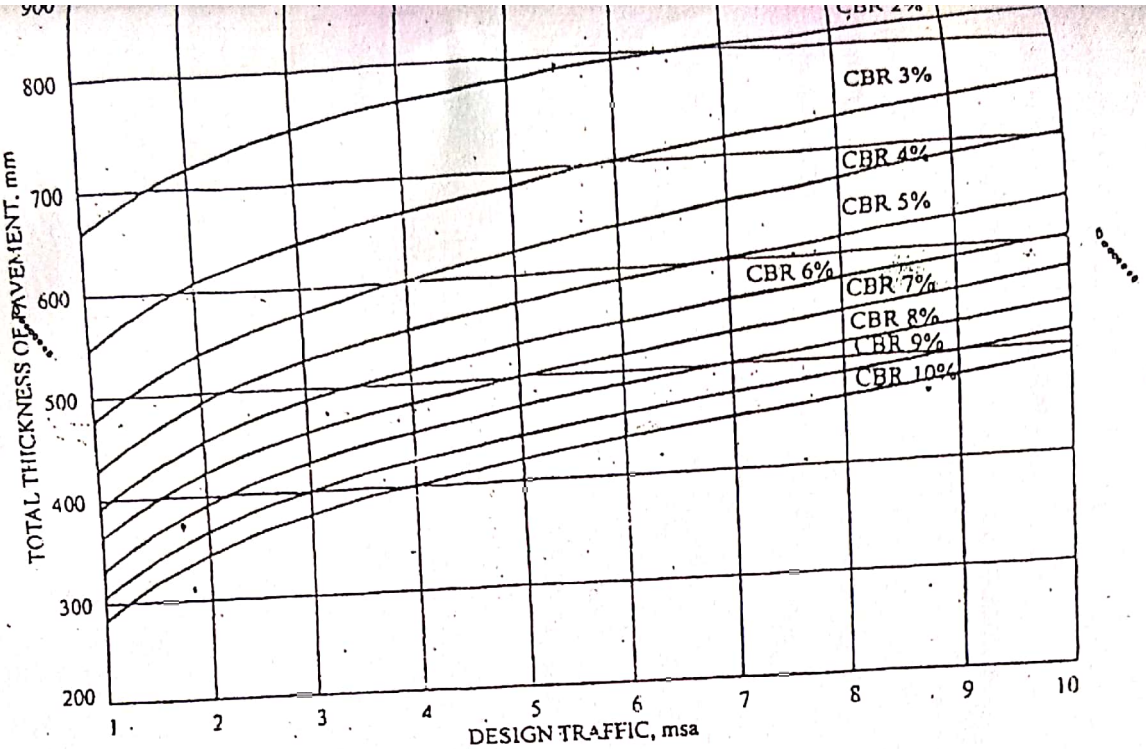


Fig. Pavement thickness design chart for traffic 1–10 msa

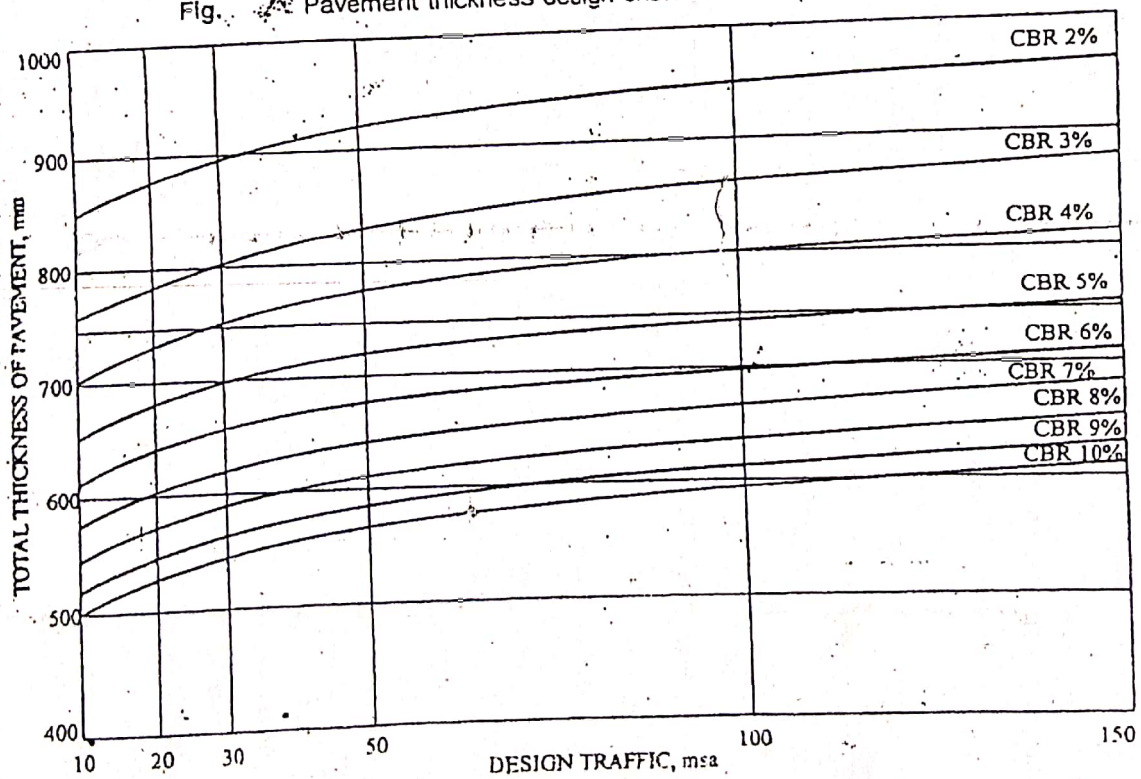


Fig. Pavement thickness design chart for traffic 10–150 msa.

fig: CBR Design charts.

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG365CI: Transportation Engineering-II *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Normal graph paper should be provided. Assume suitable data if necessary.

Answer FIVE questions. Q. No. (4) is compulsory. **5×16=80**

1(a) Define traffic engineering. Describe road-user characteristics. 2+4

(b) The following tables give the particulars collected for a section of road 1.8 km long during the occurs of a moving observer study:

North to south

S. No	Journey Time (min)	Stopped time (min)	Vehicles met with in the opposing direction			Vehicles in the same direction	
			Car	Bus	Truck	Overtaking vehicles	Overtaken vehicles
1	1.01	0.04	11	0	5	5	2
2	0.92	0.10	13	0	0	6	3
3	0.77	0.08	19	2	11	2	5
4	0.03	0.14	14	2	4	5	6
5	0.84	0.08	2	0	11	3	5
6	1.06	0.13	19	1	7	7	2

South to North

S. No.	Journey Time (min)	Stopped time (min)	Vehicles met with in the opposing direction			Vehicles in the same direction	
			Car	Bus	Truck	Overtaking vehicles	Overtaken vehicles
1	1.00	0.05	10	0	2	5	2
2	0.87	0.07	2	0	3	6	6
3	1.20	0.11	23	1	6	2	2
4	1.18	0.12	7	0	1	5	5
5	1.06	0.09	8	0	1	3	3
6	1.02	0.10	11	0	8	6	5

Calculate the flow in PCU per hour in both directions of traffic with an equivalency factor of Car=1, bus=3, Truck=2. Calculate the journey speed and running speed. 10

Contd. ...

2(a) What is the importance of parking studies in the context of Nepal? Define different types of parking with sketches. 3+3

(b) Describe different parameters associated with Traffic flow characteristics with necessary diagram. 10

3(a) Define basic requirements of intersection. What are different types of intersections? Explain with figure. 6

(b) The average normal flow of traffic on cross roads A and B during design period are 400 and 250 PCU per hour, the saturated headway on these roads are estimated as 3 secs and 4 secs respectively. The all red time required for pedestrian crossing is 15 secs. Design two phase traffic signal by webster's method. 10

4(a) Figure below is a pavement system with the resilient moduli, layer coefficients and drainage coefficients are shown. If predicted ESAL=18.6×10^6, R=95%, S_0=0.35 and ΔPSI=2.1. Select thicknesses t_1, t_2 and t_3. 12

t_1 wearing course, M_r=400,000 P_{si}, a_1=0.42

t_2 Base E_2=30,000 Psi, a_2 = 0.14, m_2=1.2

t_3 Sub-base, E_3=11,000 P_{si}, a_3=0.08, m_3=1.2

Sub-grade, M_r = 5700 Psi

ASHTO pavement design chart is attached here.

(b) What is the importance of road lighting? What are the requirements of joints in rigid pavement? 2+2

5(a) Describe the construction procedure of bituminous pavement (asphalt concrete) including the properties of materials, construction steps, plants and equipments and the tests used for quality control. 10

(b) What are the different types of road maintenance in highway? 6

6(a) List out the typical failures in rigid pavement. 6

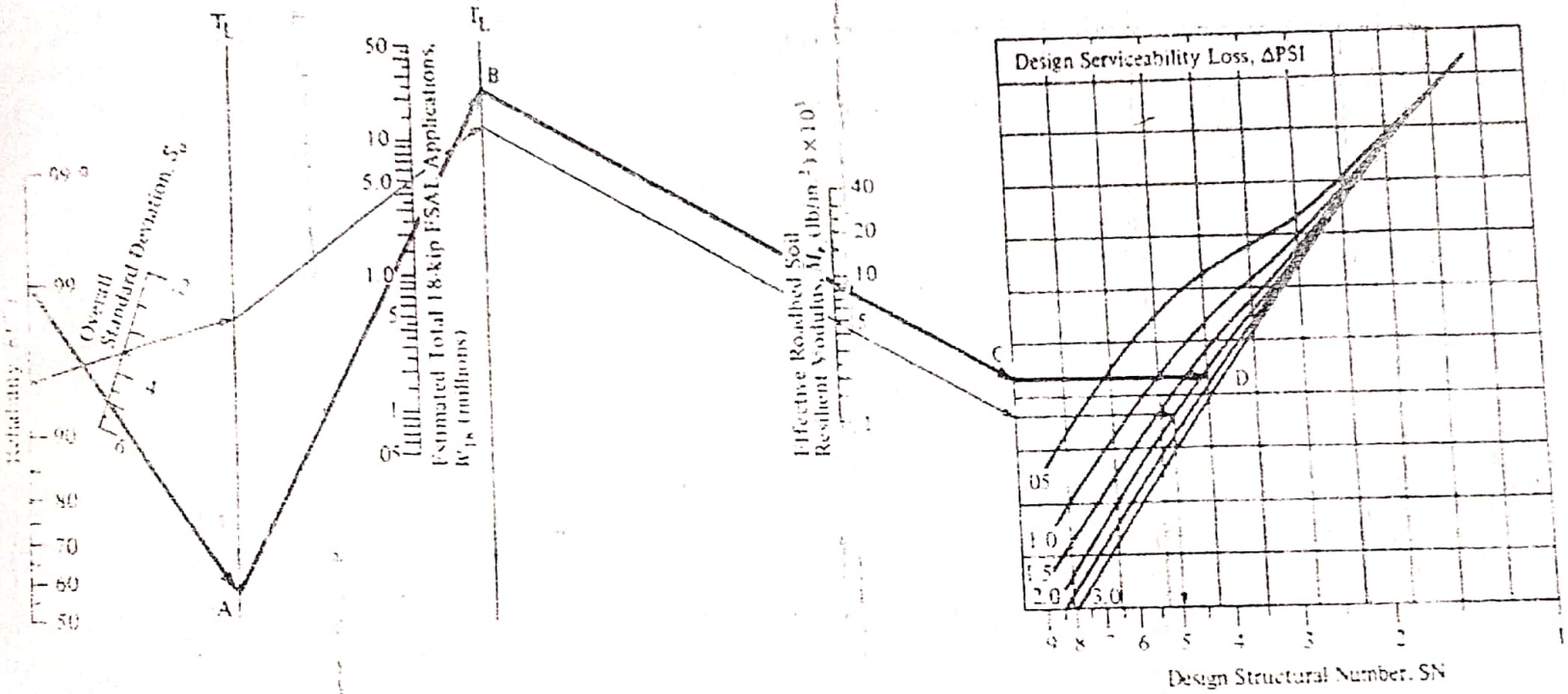
(b) What are the different characteristics of location of bridge site? What are different types of river training work? Explain with figure. 4+6

4×4=16

7. Write short notes on:

(a) Tunnel Cross Section (b) Masshaul Diagram

(c) Mud Pumping (d) Classification of bridges



AASHTO pavement design graph and tables

Resilient Modulus (psi)	a_1
450,000	0.44
400,000	0.42
300,000	0.36
200,000	0.30
100,000	0.20

CBR	a_2
100	0 14
55	0 12
45	0 11
30	0 09
20	0.07

CBR	a_3
100	0 14
40	0 12
30	0 11
25	0 10
15	0.09
10	0.08

PURBANCHAL UNIVERSITY
2015

B.E. (Civil)/Sixth Semester/ *Chance*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG365CI: Transportation Engineering-II *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Normal graph paper should be provided. Assume suitable data if necessary.

Answer FIVE questions. Q. No. (4) is compulsory.

1(a) Define Traffic Engineering. Discuss presentation of traffic volume data. 2+6

(b) On cross roads A and B, the 15 minute traffic volume during design hour was 700 and 400 PCU. The approach speeds were 50 and 30 kmph, for road A and B respectively. The width of road is 14 m and that of B is 10 m. Design the traffic signal and also draw phase diagram. Assume suitable data, if necessary. 8

2(a) Define origin and Destination study. List out its application 8

(b) The following table gives the particulars collected for a section for road 2.3 km long during the course of study of moving observer study. Calculate the flow in PCU per hour in both direction of traffic assuming an equivalency factor 1 for car, 2 for bus & 3 for trucks. Calculate the journey speed and running speed: 8

Journey: North Bound

Run No.	Journey Time		Stopped time		Vehicle met with in the opposite directions			Vehicle in same direction	
	Min	Sec	Min	Sec	Car	Bus	Truck	Overtaking Vehicles	Overtaken Vehicles
1	4	20	1	10	150	20	11	7	2
2	4	55	2	0	169	31	9	3	6
3	3	58	0	58	125	29	19	12	9
4	4	32	1	12	143	26	12	5	5
5	4	25	1	3	-136	29	5	6	3

Contd. ...

Journey: South Bound

Run No.	Journey Time		Stopped time		Vehicle met with in the opposite directions			Vehicle in same direction	
	Min	Sec	Min	Sec	Car	Bus	Truck	Overtaking Vehicles	Overtaken Vehicles
1	4	12	1	2	132	26	12	5	2
2	5	9	2	1	136	29	8	6	3
3	4	32	1	11	147	32	7	2	5
4	4	23	1	21	129	22	10	5	6
5	3	55	0	59	169	27	12	3	5

3(a) What do you mean by traffic rotary? Discuss its design factors, advantages and limitations, with sketch. 8

(b) Discuss factors affecting night visibility. 4

(c) What are the objectives of conducting speed and delay study? 4

4(a) Design the flexible pavement for a stretch of existing two- lane two way road catering 1500 cvpd each contributing 1.2 ESAL and having following. 10

Information:

(i) Growth rate of traffic = 7%

(ii) Design period = 10 years

(iii) Construction period = 2 years from last traffic count.

(iv) 87.5th percentile CBR value of sub-grade = 4%

(v) Elastic modulus of asphalt concrete for surface coarse(Eac) = 2000 Mpa

(vi) Elastic modulus of base course with modulus of elasticity = 250 Mpa

(vii) Elastic modulus of granular sub base coarse (Esub base) = 100 Mpa

(viii) Minimum thickness of asphalt concrete in surface coarse = 75 mm.

(b) Describe mud pumping with clear sketch. 6

5(a) Describe the construction procedure of penetration (grou Macadam roads including the requirements on mater construction steps, plants and equipment and the tests quality control.

(b) Define road maintenance. Describe different types of maintenance. Explain the maintenance of the earthen bituminous pavement.

6(a) Define mass haul diagram, haul, free haul, overhaul economic haul and write down the engineering importan mass haul diagram.

(b) How the ventilation and drainage problems are managed i tunneling?

PURBANCHAL UNIVERSITY
2014 (New)

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG365CI: Transportation Engineering-II

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Normal graph paper should be provided. Assume suitable data if necessary.

Answer FIVE questions. Q. No. (3) is compulsory.

1(a) What is the traffic engineering and why traffic engineering is important for civil engineers? 8

(b) A Makalu Yatayat hits a electric pole in a Naryanghat-Hetauda road sector at a speed estimated by an investigator as 20Kmph skid marks of 25m on the pavement(f=0.33) followed by skid marks of 50m on the gravel shoulder (f=0.52) approaching to the electric pole are observed. If the speed limit is 80Kmph, is the driver speeding? 8

2(a) What is the 30th highest hourly volume? Describe the causes and preventive measures of road accident. 8

(b) At a right angled intersection of two roads, road A with a total width of 14m and road B 10.5m. The traffic volume per hour of road A and B are 325 and 275 respectively. The approaching speed for A and B are 60 and 45 Kmph. Design the traffic and pedestrian signal. 8

3(a) Results of seven tests produced the following sub grade resilient modulus test values 44.9, 67.5, 68.4, 58.5, 68.3, 106.9, 80.0 MPa. The traffic classification at the end of construction is projected as below:

Number of vehicles (both direction)	Truck Factor
4000	0.003
2050	0.28
1000	1.06
1100	0.62
1200	1.05

Contd. ...

Design the flexible pavement using AIM for two lane two way road to cater the above traffic with following details: 10

(i) Minimum depth of Asphalt concrete wearing course with modulus of elasticity 2500 MPa= 50mm

(ii) Emulsified asphalt base course with E= 1250MPa

(iii) Granular Sub base course with E= 150 MPa

(iv) Annual growth rate of traffic= 6.95%

(v) Design period= 12 years

Use 87.5 percentile resilient modulus values for the design.

(b) Describe about the origin and destination study. 6

4(a) What is the traffic marking? Describe the guidelines for the selection of rotaries. 8

(b) Describe prime coat and tack coat. Explain the construction procedure of surface dressing. 8

5(a) Explain the importance of road maintenance and methods of road side slope stabilization. 8

(b) Classify the highway bridges. Briefly explain the types of road and railway tunnel. 8

6(a) What is the importance of road lighting? Explain general causes of pavement failure? 8

(b) What is the rigid pavement? Explain the temperature stresses in rigid pavement. 8

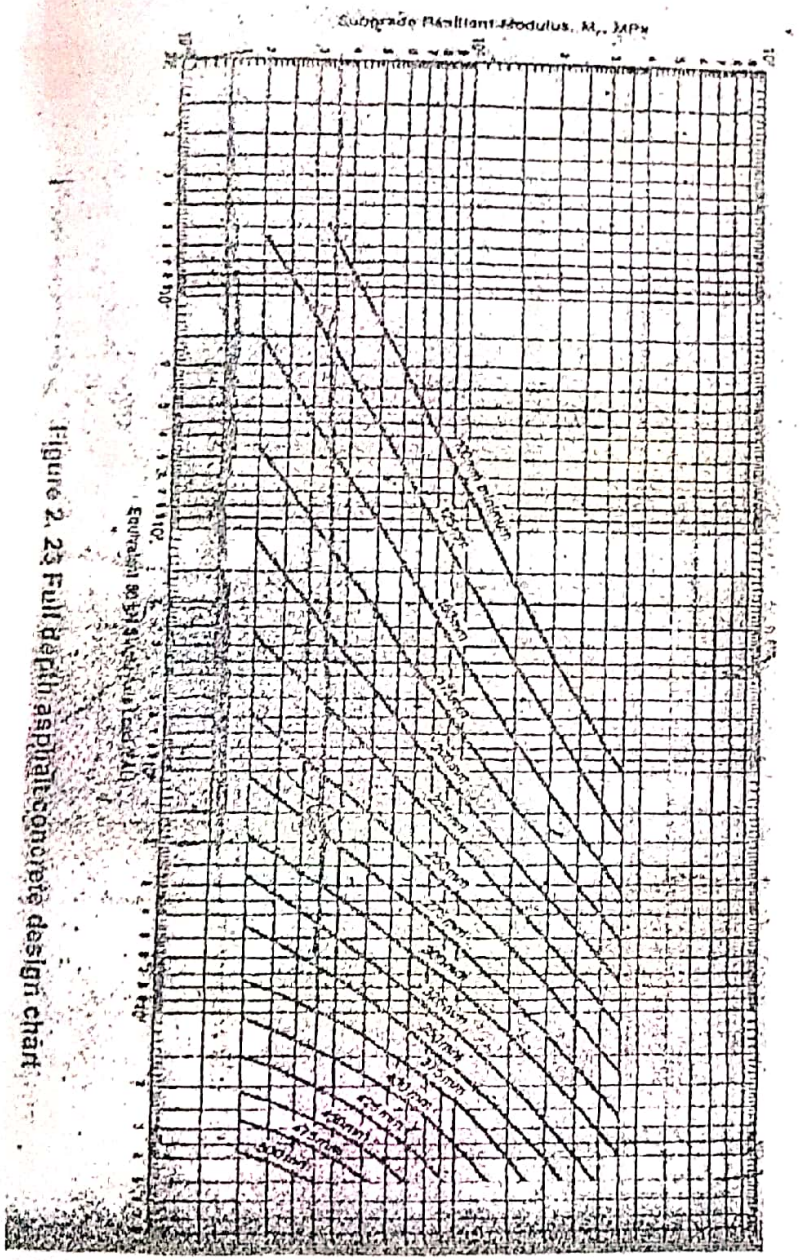


Figure 2. 23 Full depth asphalt concrete design chart

PURBANCHAL UNIVERSITY

2013

B.E. (Civil)/Sixth Semester/Final

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG365CI: Transportation Engineering-II

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Define traffic control devices. How traffic signs help in uniform traffic flow in the highway? 2+6

(b) From an in-out survey conducted for a parking area consisting of 45 bays, the initial count was found to be 30. Table gives the result of the survey. The number of vehicles-coming in and out of the parking lot for a time interval of 5 minutes is as shown in the table. Find the accumulation, total parking load, average occupancy and efficiency of the parking lot. 8

Table: In and Out survey Data

Time	5	10	15	20	25	30	35	40	45	50	55	60
In	3	2	4	5	7	8	2	4	6	4	3	2
Out	2	4	2	4	3	2	7	2	4	1	3	5

2(a) Define the different parameters associated with traffic flow characteristics. 3

(b) The average normal flow of traffic on cross roads A and B during design period are 450 and 325 PCU per hour; the saturation flow values on these roads are estimated as 1300 and 1050 PCU per hour respectively. The all-red time required for pedestrian crossing is 12 secs. Design two phase traffic signal by Webster's method. Also draw the phase diagram. 8

3(a) Differentiate the flexible and rigid pavement on the basis on structural behavior to traffic loading. 6

Contd. ...

the following parameters.

- Total number of axles = 4050
- Axle distribution has shown in table below
- Take multiplier factor for Nepal= 4.5
- Take standard axle load for Nepal = 8.2 ton
- Design period = 20 years
- Traffic growth rate = 4% for all vehicles for design period
- During CBR-test of subgrade soil; load after correction at 2.5 mm and 5.0 mm penetration (by standard plunger) are 50 kg and 75 kg. (Given the standard load at 2.5 and 5.0 mm penetration by standard plunger as 13.44 kN (1370 kg) and 21.16 kN (2155 kg) respectively)
- Modulus of elasticity of subgrade soil =100 kg/cm²
- Modulus of elasticity of base material = 750 kg/cm²
- Modulus of elasticity for asphalt concrete = 2500kg/cm²

Axle Category	No. of Axles
0 to 2 ton	15%
2 to 4 ton	15%
4 to 6 ton	20%
6 to 8 ton	30%
8 to 10 ton	10%
>10 ton	10%

4(a) Differentiate between maintenance, rehabilitation and reconstruction. Mention also different types of road maintenance. 6
3+5

(b) Define pavement condition evaluation. Describe the methods of pavement evaluation methods. 2+6 8

5(a) Mention the purpose of river bank protection. How you can protect the river bank? 2+6 8

(b) Define mass haul diagram with its salient features. 1+7 3

6(a) Describe construction procedure of Otta seal including properties of materials (aggregates, bitumen etc), plants equipment needed and quality control.

(b) Describe construction procedure of Grouted or Pene... including the properties of materials (aggregates, bitum... plants and equipment needed and quality control.

7. Write short notes on any FOUR:

(a) Activities and Techniques used in road construction

(b) Interchanges

(c) Selection of types of lamps

(d) Typical Failure on Rigid pavement

(e) Floating car method

12

PURBANCHAL UNIVERSITY

2018

B.E. (Civil/Computer/E. & C.)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks:

BEG395MS: Engineering Economics *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

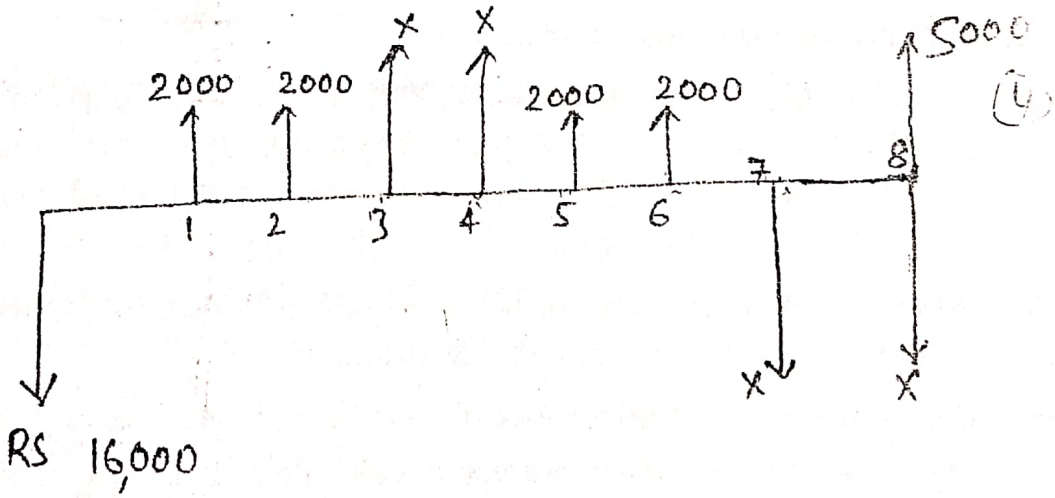
Answer FIVE questions. 5×16=

1(a) Explain the principles of Engineering Economics.

(b) Based on the following information, Calculate (a) total material cost variance, total wage variance. (c) variable overhead variance, and (d) fixed overhead variance.

Particulars	Standard	Actual
Product (units)	11,000	8,000
Direct Material (Kg)	55,000	61,250
Direct Material Cost (Rs.)	13,50,000	14,50,250
Direct Labor (Hrs)	1,00,500	68,250
Direct Labor Cost (Rs.)	1,27,50,000	85,25,000
Fixed Overhead (Rs.)	12,70,000	88,75,125
Variable Overhead (Rs.)	83,00,000	57,90,250

2(a) The following cash flow diagram has an internal rate of return of 20%. Compute the unknown value of x.



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(b) Perform sensitivity analysis by investigating the annual worth of the following project over a range of 20% in
(i) Initial investment
(ii) Annual net revenue

Initial investment	: Rs. 6,00,000
Annual revenue	: Rs. 1,10,000
Annual expenses	: Rs. 10,000
Salvage value	: Rs. 8000
Useful life	: 15 years
MARR	: 10%

Also draw the Sensitivity Graph. 8

3(a) A government agency is considering four independent projects, each having 30 years projected useful lives. The nominal interest rate is 10% per year. Using the B/C ratio method; which of the projects shown below should be selected. Use any of PW, FW or AW method. 12

Project	Initial Investment ($)	Annual Cost ($)	Annual Benefits ($)
A	12000	1250	3250
B	20000	4500	8000
C	10000	750	1250
D	14000	1850	4050

(b) Explain the time value of money? 4

4(a) A buildings priced at 1,00,00,000. If a down payment of 30,00,000 is made and a payment of 1,00,000 every month thereafter is required, how many months will it take to pay for the building? I=12% compound monthly. 10

(b) What are the drawbacks of IRR method? How does ERR method help to eliminate some of these drawbacks. 6

5(a) Consider two alternatives A & B. They have useful life of 4 and 8 year respectively. Their tabulated cash flow is shown in figure below. Suppose the expected period of required services for X & Y is only 8 years and MARR=10% per year. Show which alternative is more desirable based on the co-terminated assumptions. 12

	Project A	Project B
Investment	Rs. 350000	Rs. 500000
Annual Revenues	Rs. 190000	Rs. 250000
Annual Cost	Rs. 64500	Rs. 138500
Useful Life	4 years	8 years
Salvage Value	Rs. 10000	Rs. 15000

(b) What is a Decision Tree? Discuss its application in risk analysis

6. Write short notes on any FOUR:
(a) Elements of cost
(b) Market Research Techniques
(c) Depreciation
(d) VAT
(e) Uniform series present worth factor.

Dhruba yadav. (PUSET)

PURBANCHAL UNIVERSITY

2017

B.E. (Civil/Computer/Electronics & Comm.)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG395MS: Engineering Economics *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Define cash flow. Explain different economic systems. 2+4

(b) Estimate the price of cement if demand is 10,000 bags, when the consumption pattern is shown below: 10

S.N.	Price (Rs. Per bag)	Demand (Bags)
1	700	1000
2	680	1200
3	590	2000
4	650	1500
5	730	800
6	620	1800
7	550	2500
8	530	3000
9	500	5000
10	570	2200

2(a) Differentiate prime cost from overhead cost. Explain about process costing. 6

(b) Perform sensitivity analysis by investigating its Aw over a range of ±30% changes in estimates for: 10

(i) Investment (ii) Annual net cash flow

(iii) Market value (iv) Useful life

Investment cost= Rs. 12,00,000

Annual revenue= Rs. 2,00,000

Annual expenses= Rs. 50,000

Market value= Rs. 1,50,000

Useful life= 6 years

MARR= 8%

Contd. ...

3(a) Describe Decision Tree and its use with an example. 6

(b) Use IRR method to select the better of two mutually exclusive investment options, given below: 10

	Project X	Project Y
Initial Investment (Rs.)	100,000	150,000
Annual Revenue (Rs.)	45,000	60,000
Annual Expenses (Rs.)	10,000	15,000
Salvage Value (Rs.)	8,000	12,000
Useful Life (years)	5	5

Take MARR= 10 % annually.

4(a) Evaluate whether the following project is feasible or not: 10

Year	Net Cash Flow (Rs.)
0	-55,000
1	-15,000
2	20,000
3	25,000
4	20,000
5	30,000

Use PW and AW methods for analysis. Take MARR= 10%/year.

(b) Shrawan wishes to take a loan of Rs. 1 million from a bank, for a period of 10 years. Should the bank forward the loan? What would be his monthly installment at an interest rate of 10% compounded monthly? 6

5(a) Explain about Taxation laws of Nepal. 4

(b) Engineering Projects A, B, C, D and E are being considered with cash flows as shown:

Particulars	Projects				
	A	B	C	D	E
CapitalInvestment (Rs.)	40000	25000	90000	75000	100000
Annual Revenue (Rs.)	10000	7000	18000	14000	20000
Market_Value (Rs.)	4000	2500	9000	7500	10000
Projects A and B	Mutually Exclusive				
Project C	Contingent to B				
Project D	Contingent to A				
Project D and E	Mutually Exclusive				

List all possible alternatives and select the best alternative by PW method. Take MARR= 10%.

6. Writes short notes any FOUR: 4×4=

(a) Cost Variance Analysis
(b) Drawbacks of IRR
(c) Break-even Analysis
(d) Depreciation and Recaptured Depreciation
(e) Market Research

PURBANCHAL UNIVERSITY
2017

B.E. (Civil/Computer/Electronics & Comm.)/Sixth Semester/*Final*
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG395MS: Engineering Economics *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Explain Principles of engineering economics. 6

(b) A man aged 40 years now had borrowed Rs. 500,000 from a bank for his further studies at the age of 20 years. Interest was charged at 11% per year compounded quarterly. He wished to pay loan in semiannual equal installments with the first installment being 5 years after receiving the loan now. What did he pay in each installment? 10

2(a) Explain elements of costs and describe direct cost and indirect cost with suitable examples. 6

(b) Based on following information calculate: a. Variable overhead variance and b. fixed overhead Variance. 10

	Standards	Actual
Production (Units)	4,000	3,900
Working days	20	21
Fixed overhead (Rs)	40,000	39,000
Variable overhead	12,000	12,000

3(a) What do you mean by break even analysis? Explain with figure. 6

(b) An engineering firm is considering the following mutually exclusive projects.

EOY	Project Al	Project A2	Project A3	Project A4
0	-2500	-1200	-3600	-2000
1	1200	400	1700	800
2	1400	800	2000	700
3	1500	1000	1600	850

Which project should be selected based on IRR method, assuming MARR=15% per year. 10

Contd. ...

40

4(a) Explain taxation system in Nepal. 4

(b) Following table shows the annual per capita consumption in Kg. of fish when the price in RS. Make Hypothesized regression equation and find out the consumption if the price is set as 145 Rs. Per kg. 12

S.N.	Price/Kg	Demand
1	125	68
2	110	75
3	114	58
4	102	72
5	150	55
6	120	65
7	135	62
8	175	50
9	128	62
10	135	64

58.57

5(a) Describe the value of money with suitable examples. 6

(b) Find IRR and ERR of the following project, MARR=∈=15%. 10

Year	0	1	2	3	4	5
Cash flow (Rs.) in Lakh	-50	10	10	10	40	50

6(a) Suppose that there are two alternative electric motors that provide 100hp output. 12

Item	Alpha motor	Beta motor
Purchase cost (Rs.)	12500	16000
Efficiency	74%	92%
Maintenance (Rs.)	500 per year	250 per year
Life (Year)	10	10
Annual tax & insurance	1.5% of the investment	1.5% of the investment
MARR	15%	15%

(i) How many hours per year would the motors have to be operated at full load for the annual cost to be equal? Electricity cost= Rs. 0.05 per KW hour.

(ii) If annual operation hour is 600 hrs. Which motor should be selected?

(b) Writes short notes any TWO: 2×2=4

(a) Methods of depreciation (b) Decision Tree

(c) Cash flow

(b) Suppose that there are two alternative electric motor that provide 100 HP output: 10

Item	Alpha Motor	Beta Motor
Purchase Cost	Rs. 1250000	Rs. 1600000
Efficiency	74%	92%
O & M Cost	Rs. 50000 per year	Rs. 25000 per year
Life	10 years	10 years
Annual tax and insurance	1.5% of the investment	1.5% of the investment
MARR	15%	15%

(i) How many hours per year would the motors have to be operated at full load for the annual cost to be equal? Electricity cost= Rs. 5/kw.

(ii) If annual operation hour is 600 hrs., which motor should be selected?

6. Write short notes on any FOUR: 4×4=16

(a) VAT

(b) Recaptured depreciation

(c) Differed annuity

(d) Decision Tree

(e) Market Research

PURBANCHAL UNIVERSITY

2016

B.E. (Civil/Computer/E. & C.)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG395MS: Engineering Economics *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. **5×16=80**

1(a) Explain the principles of Engineering Economics. Explain the economic system of Nepal. 8

(b) Find prime cost, overhead cost, non manufacturing costs, total cost and profit for the following: 8

Direct material	: Rs. 24,00,000
Direct labor	: Rs. 5,00,000
Depreciation for factory building	: Rs. 1500
Branch office expenses	: Rs. 40,000
Depreciation for office building	: Rs. 8,000
Depreciation of staff cars	: Rs. 12,000
Insurance:	
Staff cars	: Rs. 1500
Office building	: Rs. 1200
Factory building	: Rs. 1500
Delivery van maintenance and running expenses	: Rs. 1600
Salaries including sales manager and factory chief engineer	: Rs. 3,00,000
Salary of sales manager	: Rs. 25,000
Factory chief engineer	: Rs. 25,000
Finished goods warehouse expenses	: Rs. 20,000
Electricity (including Rs. 4000 for administrative office)	: Rs. 40,000
Advertisement	: Rs. 20,000
Sundry factory expenses	: Rs. 3,40,000
Sales promotion	: Rs. 5,000
Office administration expenses	: Rs. 50,000
Expenses for participating in industrial exhibition	: Rs. 10,000
Sales	: Rs. 42,00,000

Contd. ...

2(a) A Construction Company is assigned to start up a new office in a city. Two lease options are available, each with a first cost, annual lease cost, and deposit-return estimates shown below:

	Location X	Location Y
First Cost (Rs.)	-150000	-190000
AOC (Rs.)	-35000	-32000
Deposit Return (Rs.)	10000	22000
Life (years)	6	9

Determine which lease option should be selected on the basis of a present worth comparison, if the MARR is 12% per year. 8

(b) What do you mean by payback period? What are their significances and drawbacks? Find the payback periods of given cash flow: 4+4

Initial investment	: Rs. 25,000
Net annual revenue	: Rs. 8,000
Salvage value	: Rs. 5000
Useful life	: 5 years
MARR	: 12%

3(a) Three mutually exclusive alternative are currently under consideration. Their respective costs and benefits are included in the table below. Each of the projects has a useful life of 25 years, and the nominal interest rate is 18% per year. Use IRR to recommend best alternative. 10

	Initial Investment (Rs.)	Annual O&M Cost (Rs.)	Salvage Value (Rs.)	Annual Benefits (Rs.)
A	85000	7500	12500	21500
B	100000	7250	17500	22650
C	120000	7000	20000	25000

(b) List out the drawbacks of IRR method? How can we eliminate some of these drawbacks? 6

4(a) Suppose that Rs. 100000 is deposited in Bank Account at the end of each quarter over the next twenty years. What is the future worth at the end of 20 years when the interest rate is 12% compound (i) quarterly, (ii) monthly, (iii) continuously. 6

(b) Find both type of B/C ratio using AW and FW formulation of the following project and determine whether the project is feasible or not?

Initial investment= Rs. 500000
Annual revenue= Rs. 80,000
Annual expenses= Rs. 15,000
Salvage value= Rs. 10,000
Useful life= 20 years
MARR= 10%

(c) Consider the following accounting information for a computer system:

Cost basis, I,= Rs. 10,000
Useful life, N,= 5 years
Estimated salvage value= Rs. 778

Compute the annual depreciation allowances and the resulting book values using the double declining depreciation method

	Alternatives	
	A	B
Capital Investment (Rs.)	3500	5000
Annual Revenue (Rs.)	1900	2500
Annual Expenses (Rs.)	645	1020
Useful life (yrs)	5	5
Salvage value (Rs.)	0	0

5(a) What shall be the demand if price is set to be Rs.75/kg? Use linear regress model.

S.No.	Price (Rs./kg)	Demand (Kg)
1	62	280
2	68	310
3	78	350
4	89	370
5	85	360
6	53	250
7	71	320
8	66	290
9	67	300

Contd...

PURBANCHAL UNIVERSITY

2015

B.E. (Civil/Computer/E. & C.)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG395MS: Engineering Economics *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. 5×16=80

1(a) What is engineering economics? Explain about different types of economic systems. 2+4

(b) An entrepreneur is planning to have personal savings totaling of Rs. 2,000,000 when he retires at age of 58. He is now 20 years old. If the annual interest rate is 6% in his saving account, what equal end of year amount must he save to accomplish his goal? 10

2(a) Discuss about job and process costing. 6

(b) The following table gives the data for the production of 100 badminton racquets:

Leather: 40m at Rs. 300/m

Gut: 400m at Rs. 60/m

Graphite: 150kg at Rs. 225/kg

Labour rate: Rs. 60/hr

Total annual direct labour: 300,000 hrs

Total annual factory overheads: Rs. 6000,000

Labour hours needed: 250 hrs.

Find out the manufacturing costs of each racquet. Also breakdown the costs into component of prime costs and overhead costs. 10

3(a) Define nominal and effective interest rates with an example. 6

Contd. ...

(b) Evaluate the following project based on AW & FW assumptions, if MARR =12%. 10

End of Year	Net Cash Flows (In Rs. 000's)
0	-300
1	-100
2	100
3	100
4	100
5	200
6	200

4. (a) Find modified B/C ratio for the following project. Use PW formulation. Also test the feasibility. 6

Investment (Rs.) = 1,00,000
Expected life (yrs) = 5
Salvage value (Rs.) = 10,000
Annual Benefit (Rs.) = 80,000
Annual O & M costs (Rs.) = 40,000
Interest Rate (%) = 16

(b) The following data have been established for two mutually exclusive investment alternatives A and B, associated with small engineering project for which revenue as well as expenses are involved. They have useful lives of 5 years respectively. If the expected period of the required serive for A and B is only 4 years and MARR=10%, which alternative is more desirable using IRR method? 10

	Alternatives	
	A	B
Capital Investment (Rs.)	3500	5000
Annual Revenue (Rs.)	1900	2500
Annual Expenses (Rs.)	645	1020
Useful life (yrs)	5	5
Salvage value (Rs.)	0	0

5(a) Explain about VAT rules of Nepal.

(b) Investigate the PW of the following project of a machine over range of ±20% in (i) Capital investment (ii) Annual net cash (iii) Market value (iv) useful life

Initial investment, I = Rs. 11,500
Net Annual Revenue, A = Rs. 3000
Salvage value, S = Rs. 1000
Useful life, N = 6 yrs
MARR = 10%

Draw also the sensitivity diagram.

6. Write short notes on any FOUR:
(a) Factors affecting accuracy of forecasting
(b) Recaptured depreciation
(c) ERR
(d) Cash flow in Uniform gradient
(e) Cash flow diagram

PURBANCHAL UNIVERSITY
2015

B.E. (Civil)/Sixth Semester/ *Chance*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks:

BEG395MS: Engineering Economics *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) "Today's world is the era of Mixed-economy." Justify the sentence with suitable arguments. 5

(b) Determine the two equal deposits (the first deposit required now and the second deposit at the end of year 6) so that you can withdraw $2,000 at the end of each year for the next 12 years. Assume that money can earn 4% interest, compounded annually. 7

(c) Derive $F = P(1+i)^N$ where symbols have their usual meanings. 4

2(a) Compare job and process costing and discuss them in brief. 6

(b) The following table gives the data for the production of 200 badminton racquets:

Labour rate= Rs. 50/hr.
GUT= 300 m at Rs. 65/m
Graphite= 125 kg at Rs. 210/kg
Leather= 45m at Rs. 250/m
Total annual direct labour= 200,000 hrs.
Total annual factory overheads= Rs, 5,000,000
Labour hours needed= 400 hrs.

Breakdown the costs into components of prime costs and overhead costs. Also find out the manufacturing costs of each racquet. 10

3(a) What do mean by Minimum attractive Rate of Return? Explain. 5

Contd. ...

(b) Alpha industry is planning to expand its production operation. It has identified three different technologies for meeting the goal. The initial outlay and annual revenues with respect to each of the technologies are summarized below. Suggest the best technology which is to be implemented based on IRR method. Assume MARR= 25%. 11

	Technology 1	Technology 2	Technology 3
Investment cost (Rs.)	1200,000	2000,000	1800,000
Annual net revenue (Rs.)	400,000	600,000	180,000
Life (yrs.)	10	10	10

4(a) Find both types of B/C ratios for the following project. Also find whether the project is feasible or not. Use AW formulation. 8

Capital investment (Rs.)= 1,50,000
Expected life (yrs.)= 10
Market value (Rs.)= 15,000
Annual revenue (Rs.)= 60,000
Annual expenses (Rs.)= 30,000
MARR= 14%

(b) The following alternatives are being considered for a lab project. Assume the interest rate is 8%. Which option is less expensive (Use 'Co-terminated Assumption Approach')? 8

	Option A	Option B
First Cost (Rs.)	39,000	20,000
Salvage Value (Rs.)	2,000	4,000
Annual O&M Cost (Rs.)	1,200	1,800
Useful Life (yrs)	20	10

Assume expected period of a project= 20 years.

5(a) Discuss briefly about "Taxation System in Nepal". 4

(b) Perform Sensitivity Analysis by investigating its AW over a range of ±40% changes in the estimates for: (i) investment, (ii) annual net cash flow, (iii) Market value, (iv) useful life. 12

Investment Cost (Rs.)= 11,500,000
Annual revenue (Rs.)= 5,00,000
Annual expenses (Rs.)= 2,00,000
Market value (Rs.)= 1,00,000
Useful life= 8 years

6. Write short notes on any FOUR:

(a) Criteria for desirable sales forecasting procedures
(b) Drawbacks of IRR
(c) Elements of Costs
(d) Projects operating under conditions of uncertainty
(e) Time value of money

PURBANCHAL UNIVERSITY
2014 (New)

B.E. (Civil/Computer/Electronics & Comm.)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG395MS: Engineering Economics

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Explain the principles of engineering economics. 6

(b) Explain the nominal and effective interest rate with suitable examples. What will be the required quarterly payment to repay a loan of $20,000 in 5 years, if the interest rate is 8% compounded continuously?

2(a) What is Inconsistent ranking problem in Rate of Return method and how it can be removed to compare mutually exclusive alternatives? Explain with example. 6

(b) A company is planning to install new automated plastic molding press. Four different presses are available. The initial capital investment and annual expenses for these four mutually exclusive alternatives are as follows:

	Press		
	P1	P2	P3
Capital Investment ($)	24000	30400	52000
Useful life (year)	5	5	5
Annual Expenses ($)	31200	29128	22880

Assume each press has the same output capacity (120000 units per year) and has no market value at the end of its useful life; the selected analysis period is five years; and any additional capital invested is expected to earn at least 10% per year. Which press should be chosen if (a) 120000 non defective units per year are produced by each press and all units can he sold, and (b) each press will produces 120000 units per year but the estimated reject rate is 8.4% for P1, 0.3% for P2, 2.6% for P3, and 5.6% for P4 (all non defective units can be sold). The selling price is 50.375 per unit. 10

Contd. ...

4. The City Ridge, has received designs for a new patient room wing to the municipal hospital from two architectural consultants. The three financial estimates are given as:

	Design A	Design B
Construction Cost, $	1000000	1500000
Building maintenance cost, $ per year	35C00	55000
Savings in operations, $ per year	200000	450000

The discount rate is 5%, and the life of the building is estimated as 30 years. Use conventional B/C ratio analysis to select design A or B. 8

(b) The company has $20000 to allocate next year to new projects. Any or all of the five projects in the table below may be accepted. Each project has an expected life of 9 years. Select the projects to invest if a minimum of 15% return is desired. 8

Project	Initial Investment ($)	Annual NCF ($)	Project Life (years)
A	10000	2870	9
B	15000	2930	9
C	8000	2680	9
D	6000	2540	9
E	21000	9500	9

4(a) Explain about the taxation system in Nepal. 4

(b) A computerize machining center has been proposed for a small tool manufacturing company. If the new system, which costs $125000, is installed, it will generate annual revenues of $100000 and will require $20000 in annual labor, $12000 in annual material expenses, and another $8000 in annual overhead (power and utility) expenses. The automation facility would be classified as a 7 year MACRS property. The company expects to phase out the facility at the end of 5 years, at which time it will be sold for $50000. Find the year by year after tax net cash flow for the project at a 40% marginal tax rate based on the net income and determine the after tax net present worth of the project at the company's MARR of 15%. 12

5(a) Suppose Ram has $50000 to invest in the financial market for one year. His choice has been narrowed to options:

Contd. ...

Option 1: Buy 1000 shares of ADC communication @$50 p share that will be held for one year. Since this is a new initi public offering (IPO) there is not much research informati available on the stock. This will entail a brokerage fee of $100 f this size of transaction (for either buying or selling stocks). F simplicity, assume that the stock is expected to provide return three different levels: high level (A) with a 50% return ($2500 medium level (B) with a 9% return ($4500), or low level (C) with 30% loss (-$15000), and that the probabilities of the occurrences are assessed at 0.25, 0.40, and 0.35, respectively. is not anticipated any stock dividend for such a growth orient company.

Option 2: Purchase a $50000 bond, which pays interest at effective annual rate of 7.5% ($3750). The interest earned fr the Treasury bond is non-taxable income. However, there is $150 transaction fee for either company.

Ram's question is which alternative to choose to maximize financial gain. At this point, Ram is not concerned about seeki some professional advice on the stock before making a decisio We will assume that any capital gains will be taxed at 20% f any long term gains. Rams MARR is known to be 5% after taxe Determine the pay off amount at the end of each branch tip.

(b) Write short note on Market Research Techniques and Sal Forecasting.

6(a) Your firm has purchased an injection molding machine at a co of $100,000. The machine's useful life is estimated at 8 year Your accounting department has estimated the capital cost f this machine at about $25,455 per year. If your firm's MARR 20%, how much salvage value do you think the accounti department assumed at the end of 8 years.

(b) Write short notes on any THREE: 3×4=

(a) Break-even Analysis

(b) Opportunity Cost and Sunk Cost

(c) Factors affecting Accuracy of Forecasting

(d) Recaptured Depreciation

$P(1+i)^n = A\left[\frac{(1+i)^n - 1}{i}\right]$

$F = P(1+i)^n$

Pass

PURBANCHAL UNIVERSITY

2014

B.E. (Civil)/Seventh Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG495MS: Engineering Economics

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Discuss about time value of money. Write about nominal and effective interest rate. 6

(b) The following information has been obtained from the records of manufacturing company using standard costing system.

	Standard	Actual
Production units	3000	2500
Working days	27	25
Fixed overhead Rs.	14000	12500
Variable overhead Rs.	10000	11000

Find all the variances including its components. 10

2(a) What do you mean by payback period? What are their significances and drawbacks? 6

(b) A construction company has requested that Rs. 500,000 be spent now during construction on software and hardware to improve the efficiency of environmental control systems for the construction of a skyscraper. This is expected to save Rs. 10,000 per year for 10 years in energy costs and Rs. 700,000 at the end of 10 years in equipment refurbishment costs. Find the rate of return? 10

3(a) Write about sensitivity analysis and Scenario analysis. What are their significances? 6

(b) Consider the following three sets of mutually exclusive projects. Each alternative has a 20 year study period and no salvage value. Use incremental increase method to choose the best alternative assuming MARK = 6%. 10

Contd. ...

Alternative	A	B	C
Investment	-2000	-4000	-5000
Uniform annual benefits	410	630	700

4(a) Explain about taxation system of Nepal. 6

(b) A company produces an electronic timing switch that is used in consumer and commercial products made by several other manufacturing firms. The fixed cost and the total cost are Rs. 40,000 and Rs. 85,000 respectively. The total sales are Rs. 105,000 and sales volume is 15,000 for this situation,
(i) find breakeven point in terms of number of units.
(ii) What should be the output if the profit desired is Rs. 50,000? 10

5(a) A buildings priced at 1,00,00,000. If a down payment of 30,00,000 is made and a payment of 1,00,000 every month thereafter is required, how many months will it take to pay for the building? I=12% compound monthly. 10

(b) What are the drawbacks of IRR method? Explain how ERR method removes the drawbacks of IRR method? 6

6. Write short notes on any FOUR: **4×4 = 16**

(a) VAT
(b) Risk analysis
(c) Opportunity cost and marginal cost
(d) Nepal's economic system
(e) Demand analysis
(f) Market Research

$F = P(1+i)^n$

$F = A\left[\frac{(1+i)^n - 1}{i}\right]$

$P(1+i)^n = A\left[\frac{(1+i)^n - 1}{i}\right]$

$P(1+i$

PURBANCHAL UNIVERSITY

2018

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 3

BEG363CI: Irrigation Engineering *(New Course)*

Candidates are required to give their answers in their own words as f as practicable.

All questions carry equal marks. The marks allotted for each sub-questi is specified along its side.

Answer FIVE questions. Assume necessary data if necessary. 5×16=

1(a) Define irrigation and explain the irrigation development histo in Nepal. 2+

(b) Explain the term duty and delta. Derive relationship between th two. 2+

(c) Describe causes and effects of water logging. 3+

2(a) A certain crop is grown in an area of 3000 hectares, which is fe by canal. The data pertaining to irrigation are as follows.

Field Capacity of soil: 26%

Optimum Moisture: 12%

Permanent wilting Point: 10%

Effective depth of root zone: 80cm

Apparent relative density of soil: 1.4

An irrigation is supplied, when moisture content of soil falls to 15%, at an interval of 10 days. Assume overall efficiency as 42%, find.

(i) The daily consumptive use

(ii) Water discharge in m^3/s required in canal head

(b) Describe canal alignment with neat sketch. Elucidate assessment of water requirements in canals and command area. 3+5

3(a) Design an irrigation channel to carry 40 cumecs of discharge with B/D, i.e base width to depth ratio as 2.5. The critical velocity ratio is 1.0. Assume a suitable value of Kutter's rugosity coefficient. 8

(b) Explain components of cross section of irrigation canal with neat sketch. Differentiate stable canal according to Kennedy and Lacy theory. 5+3

4(a) Write down the major components and functions of typical headworks commonly used in irrigation scheme with neat sketch. 6

(b) An impervious floor of weir on permeable soil is shown in fig 4(b). Calculate uplift pressure at key points using Khosla's theory. 10

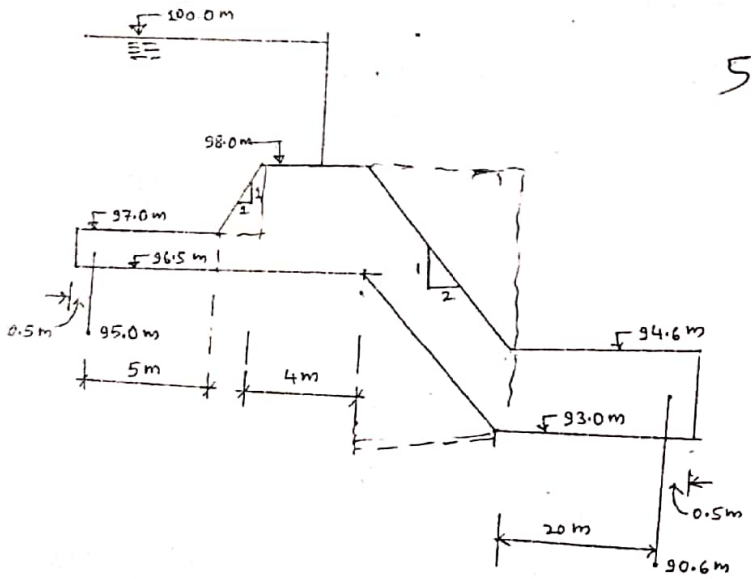


Fig 4(b)

5(a) Describe different types of canal outlets from function and management perspective. 6

(b) Design and sketch drop structure located downstream of off taking canal with the following data: 10

U/S section	D/S Section
Q = 2 cumecs	Q = 1.5 cumecs
Canal bed level = 98.0 m	Canal bed level= 96.5 m
Water depth = 1.0 m	Water depth = 0.9 m
Bed width = 1.8 m	Bed width = 1.5 m
Free board = 0.4 m	Free board = 0.4 m

Assume Bligh's coefficient, C=7 for the given soil.

6(a) Design and sketch guide bund and launching apron for following data:

Maximum Discharge = 3500 cumec
Highest flood level = 103.5m
River bed level = 100m
Average diameter of river bed material = 0.12mm.

(b) Write short notes on any TWO: 4+4
(i) Suitability of Aqueduct and syphon structure
(ii) Irrigation Development Policy 2070
(iii) Operation and maintenance of surface irrigation system

Dhruba yadav. (PUSET)

PURBANCHAL UNIVERSITY
2017

B.E. (Civil)/Sixth Semester/*Final*
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG363CI: Irrigation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume necessary data if necessary. 5×16=80

1(a) Define Irrigation. List out the existing and upcoming major irrigation projects along with their command areas. What is FMIS, explain with its characteristics. 1+3+4

(b) Wheat is to be grown in a field having a field capacity equal to 27% and the permanent wilting point is 13%. Find the storage capacity in 80 cm depth of soil, if the dry unit weight of the soil is 14.72 KN/m3. If the irrigation water is to be supplied when the average soil moisture falls to 18%, find the depth required to be supplied to the field if field application efficiency is 80%. What is the amount of water needed at the canal outlet if the water lost in the water courses and field channels is 15% of outlet discharge? 8

2(a) Classify the canal based on discharge and alignment. List out the methods to improve the duty of the canal. 4+4

(b) Design an irrigation channel to carry 50 cumecs of discharge. The channel is to be laid at a slope of 1 in 4000. Take CVR=1.12. 8

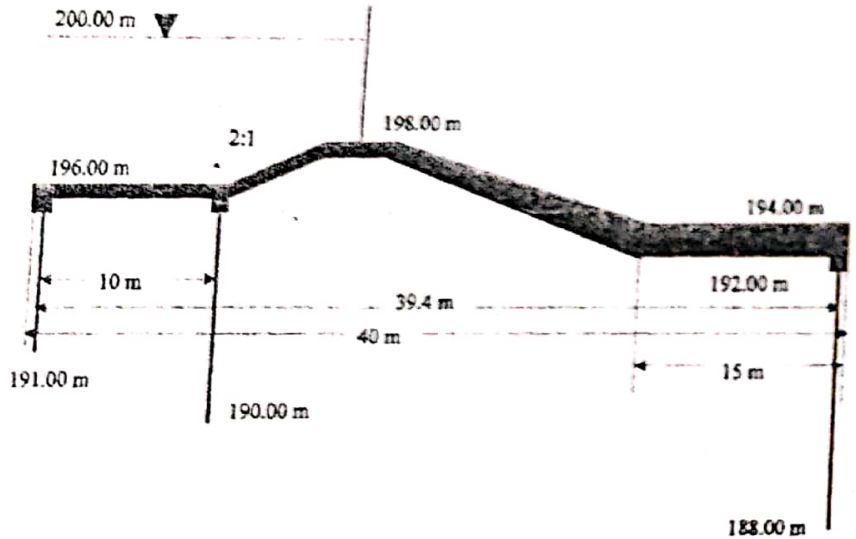
3(a) What do you mean by economics of lining? Explain with mathematical formula. What is Lacey's perimeter? Derive the relation for this parameter with discharge, $P = 4.75\sqrt{Q}$. 4+4

(b) What is waterlogging? Derive the relation for the spacing of the pipes in the subsurface drainage system. 2+6

4(a) What is irrigation system planning? Write down the different steps of irrigation planning? 4

Contd. ...

(b) Determine the pressure percentage at the key points. Also check the sufficiency of the thickness of the concrete floor (Sp. Gr.= 2.4) at the mid-section, 7.5m u/s, of the d/s floor. Factor for the slope 2:1= 6.5. 12



5(a) Explain with definition sketch the suitability of different types of cross-drainage structures in irrigation. 4

(b) Design the suitable cross drainage structure for the following data: 12

Canal:

Full Supply Discharge: $20m^3/s$
Full Supply Level: RL418.50m
Bed Level: RL 417.00m
Bed Width: 10m
Side Slope: 1.75H:1V

Drainage:

High Flood Discharge: 180 m^3/s
High Flood Level: RL 415.00m
High Flood Depth: 2. 50m

Assume the suitable data, if necessary.

6(a) List out the objectives of the irrigation policy developed by GoI

(b) Design and draw the guide bund for the bridge with the follow data:

Design flood discharge= 12000 cumecs
Silt factor=1.2
Bed level of river=211.00 masl
High flood level=215.00 masl

PURBANCHAL UNIVERSITY
2017

B.E. (Civil)/Sixth Semester/*Final*
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG363CI: Irrigation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume necessary data if necessary. 5×16=80

1(a) Justify which Irrigation method should be promoted in context of Nepal with proper technical considerations. 6

(b) Potato is to be grown in a field having a field capacity equal to 25% and the permanent wilting point is 12%. Find the soil moisture storage capacity in 75 cm depth of the soil, if the dry unit weight of the soil is 1.5 g/cc. If irrigation water is to be supplied when the average soil moisture falls to 15%, find the water depth required to be supplied to the field if the field application efficiency is 75%. What is the amount of water needed at the canal outlet if the water lost in the water courses and the field channel is 15% of the outlet discharge? Calculate the time of irrigation to be applied for the potato field of 4 ha if the available discharge at the canal outlet is 2 m^3/s. 7+3

2(a) With suitable sketches, explain various methods on which the canals can be aligned. Define duty and delta and establish relationship between them. 4+2+2

(b) Define Tractive force. Explain sediment transport and tractive force approach in canal design. 2+6

3(a) Compare Bligh's creep theory and Lane's weighted creep theory. Explain how the safety of any hydraulic structures against uplift can be ensured using Bligh theory. 4+4

(b) The Design discharge of a branch canal in Babai irrigation project is $30 m^3/s$ at a slope of 1/4000. Find the trapezoidal channel with side slope of 1:2 (H:V) using Kennedy's theorem for the canal taking Kutter's n = 0.025 and critical velocity ratio m = 1.2. 8

Contd. ...

4(a) Derive subsurface drain spacing formula: $s = \frac{4k}{q}(b^2 - a^2)$ 4

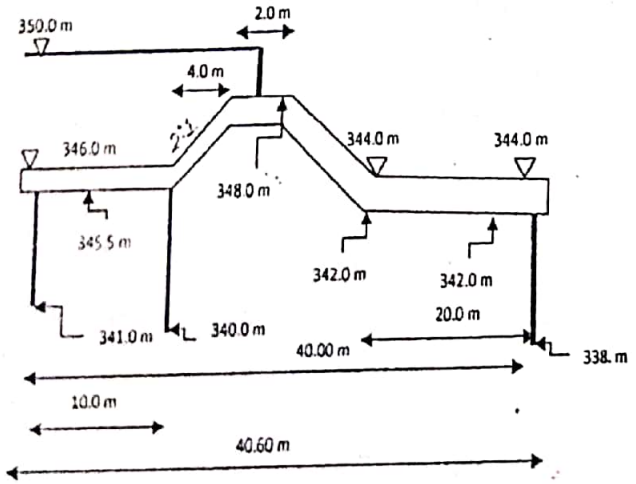
Terms in the equations has its usual meaning.

(b) Design a Sharada Type Vertical canal fall for following data. Assume suitable data if necessary. Show the designed section with proper sketches. 12

(i) Design bed width of the canal at upstream and downstream = 3.5m
(ii) Drop height = 1.8 m
(iii) Discharge Q = 10 m3/s
(iv) Bed slope of canal u/s and d/s = 1:3000
(v) Side slope of the canal = 1:1
Assume safe exit gradient = 0.20 and manning's roughness coefficient = 0.012

5(a) Write down the short term, medium term and long term irrigation sector targets that were mention in National Water Plan 2004. 4

(b) Using Khosla's theory, find the seepage pressure head at the key points of the diversion head works section as shown in figure given below. Check the sufficiency of the thickness of concrete (S.G.=2.4) provided at the mid section of downstream floor (cistern) of 20m long. Take slope correction factor for slope 2:1 (H:V) = 6.5? 12



6(a) Design and sketch a suitable guide bank (Bell's bund) including launching apron for a bridge site with the following data. 8

Contd. ...

Maximum Discharge = 4500m³/sec
High flood level = 203m
River bed level = 198.00m
Average diameter of river bed material = 0.10mm.

(b) Write short notes on (any two)
(i) Different types of spurs used in river training works
(ii) Uphoff's matrix for irrigation management
(iii) Selection of suitable cross-drainage structure
(iv) Flexibility and sensitivity of canal outlet.

PURBANCHAL UNIVERSITY
2016

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG363CI: Irrigation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume necessary data if necessary. 5×16=80

1(a) Illustrate the major function of irrigation. Elaborate the history of irrigation development in Nepal. 2+2

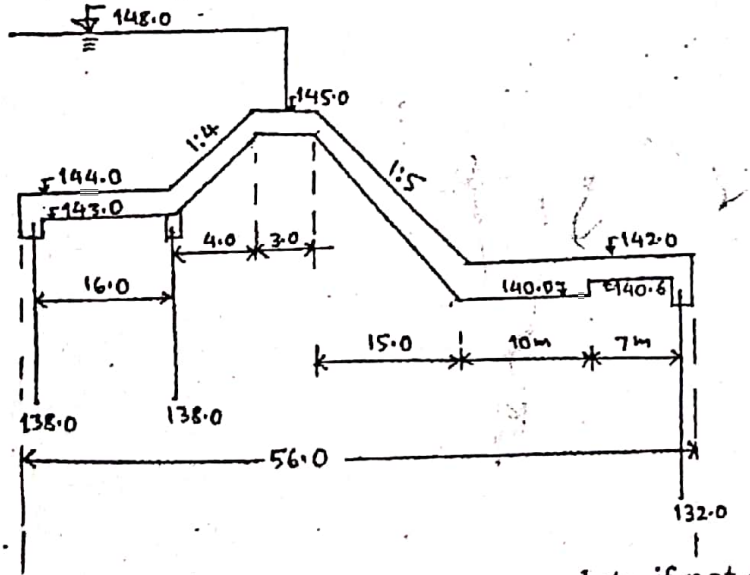
(b) 1000m³ of water is applied to a farmer's rice field of 0.75 hectares. When the moisture content in the soil falls to 40% of the available water between the field capacity equal to 36% of soil and the permanent wilting point is 15% of the soil crop combination, determine the field application efficiency. The root zone depth of rice is 80 cm. Assume porosity of the soil is 0.4. 8

(c) Explain the method of irrigation. 4

2(a) How canal can be classified, explain them briefly? Illustrate the alignment of canal with necessary sketches in brief? 4+4

(b) Design a main canal of Babai Irrigation Project of discharge 20.00 cumecs. Assume necessary data. 8

3(a) Determine the percentage pressure of intermediate pile and exit gradient of given figure below. 12



All dimensions are in meter. Assume any data if not given.

Contd. ...

(b) Explain the components of headwork with the sketch. 4

4(a) Illustrate the institutional aspects of irrigation system management in Nepal. 4

(b) Design a 1.5m sarda type fall for a canal carrying a discharge of 10 cumec with the following given data: 12

Bed level u/s: 105.00m
Bed level d/s: 103.50m
Side slope of channel: 1:1
FSL u/s: 106.50 m
Bed width u/s and d/s: 3m
Soil type: Good loam
Bligh's coefficient: 6

Assume any other suitable data, if needed.

5(a) Derive the expression for the spacing of sub-surface drainage. 8

(b) Why river training works is necessary? List out the various methods of river training works? Mention the design consideration of spur? 2+2+4

6(a) What is cross drainage works? Why it is necessary? Mention the types and their condition of application in brief with necessary sketches? 1+1+6

(b) Write short notes on: 4+4

(i) FMIS in Nepal
(ii) Guide bunds

PURBANCHAL UNIVERSITY
2015

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG363CI: Irrigation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume necessary data if necessary. 5×16=80

1(a) Why irrigation needs in Nepal. Explain the development of irrigation in Nepal. 4+4

(b) Define GCA, CCA, NCA, Base period and Ror period. Derive a relation between duta and delta. 5+3

2(a) A certain crop is grown in an area of 3000 hectares, which is fed by canal. The data pertaining to irrigation are as follows:
Field Capacity of soil: 26%
Optimum Moisture: 12%
Permanent wilting Point: 10%
Effective depth of root zone: 80cm
Apparent relative density of soil: 1.4

If frequency of irrigation is 10 days and overall efficiency is 22%, find: (i) the daily consumptive use, (ii) water discharge in m^3/s required in canal. 8

(b) Derive the relation among slope, silt sector and discharge from Lacey's Theorem. 8

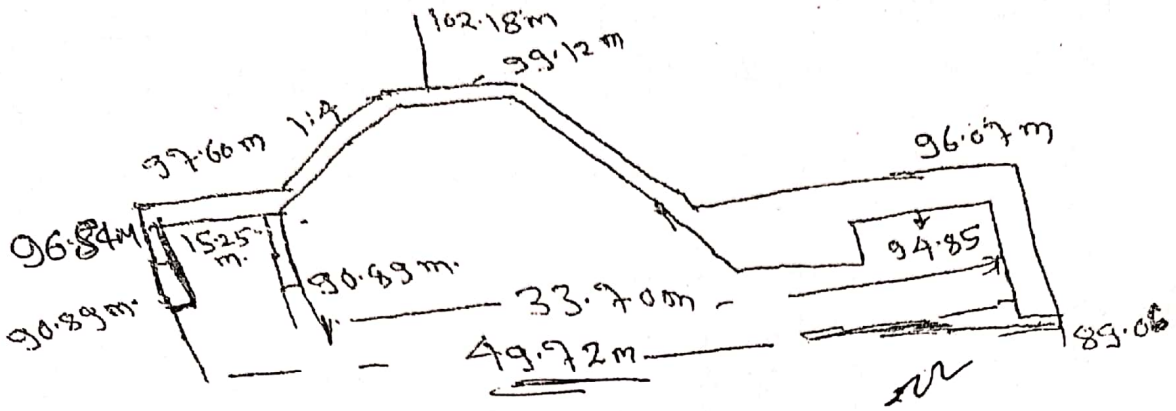
3(a) Design a regime canal (using Lacey's equations) for a discharge of $50m^3/sec$ with silt factor 1.1. Assume trapezoidal section with side slope 0.5:1. 8

(b) Define water logging. Explain its causes, effect and prevention of water logging. 8

4(a) Write down the major components and functions of typical headwork's commonly used in irrigation scheme with sketch. 6

Contd. ...

(b)



From the given data in Fig., find the corrected percentage pressure at intermediate sheet pile and exit gradient from the Khosha's seepage theory. 10

5(a) Differentiate between following with explanation: 3×3=9
(i) Aqueduct and siphon aqueduct
(ii) Non-modular and semi modular canal outlets
(iii) Distributary head regulator and cross regulator

(b) Design a Sarda type of fall with the following data: 7
(i) Full supply discharge u/s/d/s = 11.0 cumees
(ii) F.S.L. u/s/d/s = 101.50m/100.50m
(iii) Full supply depth u/s/d/s = 1.50/1.50 m
(iv) Bed level u/s/d/s = 100.0m/99.0m
(v) Bed width = 8.0m
Assume Bligh's co-efficient = 7.

6(a) Design and sketch guide bund and launching apron for straight portion for following data: 8
Maximum discharge: 5000m³ /see
Highest flood level: 104m
River bed level: 100m
Average diameter of river bed material: 0.10mm

(b) Explain the operation and maintenance of irrigation system. Explain the development of FMIS in Nepal. 8

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Sixth Semester/*Chance*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG363CI: Irrigation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume necessary data if necessary.

1(a) How can you define irrigation? Mention the major advantages of irrigation. Explain briefly the factors affecting the crop water requirement? 1+3+4

(b) Explain in brief design principle of sprinkler irrigation system. A certain crop is grown in an area of 2600 hectares, which is fed by a canal system. The data pertaining to irrigation are as follows:

Field capacity of soil= 28%
Optimum moisture content= 13%
Permanent wilting point= 10%
Effective depth of root zone= 75 cm
Apparent relative density of soil= 1.45

If the frequency of irrigation is 10 days and the overall irrigation efficiency is 42%, find the:

(i) daily consumptive use and,

(ii) water discharge in m^3/s required in the canal feeding the area. 4+4

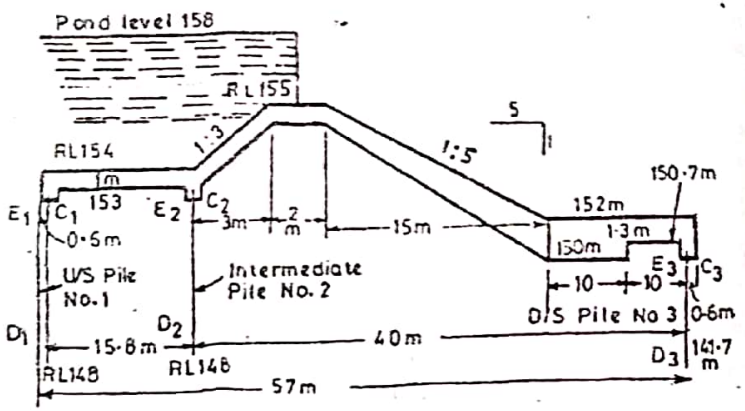
2(a) Describe canal alignment with neat sketch. How do you assess water requirement in canals and command area? Elucidate. 4+4

(b) Design a regime channel for a discharge of 45 cumec and silt factor as 1.1 using appropriate theory. 8

3(a) How will you justify economically the necessity of lining an existing canal, illustrate mathematically? Write short notes on: (i) Spoil bank and (ii) Berm. 4+2+2

Contd. ...

(b) Determine the corrected % pressures at key points in pile line no. 2 analytically using the principle of Khosla's theory for the given figure. 8



4(a) Describe the design criteria of vertical drop structure. 4

(b) Design a suitable cross drainage works for the following data at the crossing of a canal and a drainage: 12

Canal:
Full supply discharge: 20 m^3/s
Full supply level: RL 213.50m
Bed level: RL 212.00m
Bed width: 10m
Side slope: 1.5:1 (H:V)

Drainage:
High flood discharge: 150 m^3/s
High flood level: RL 210.00m
High flood depth: 2.50m
General ground level: RL 212.50m

Assume any other suitable data, if needed.

5(a) Determine the size of a sub-surface drain at the outlet of a 6 hectares of a drainage area, if the drainage coefficient is 15 mm and the tile grade is 0.4%. Assume the rugosity coefficient for the tile drain material as 0.013. 6

(b) Describe participatory approach in management of FMIS. Explain types of canal outlets with neat sketch where necessary. 4+6

6(a) What are the effects of degradation on the hydraulic structures? Explain design procedure of spur. 2+6

(b) Elaborate the institutional aspects of irrigation system management in Nepal. Describe in brief the operation and maintenance of irrigation system in context of Nepal. 4+4

PURBANCHAL UNIVERSITY
2014 (New)

B.E. (Civil)/Sixth Semester/*Final*
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG363CI: Irrigation Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume necessary data if necessary.

1(a) Explain different types of irrigation developed so far in Nepal with their status? 6

(b) Calculate volume of water to irrigate a field plot of 5ha with the following data:

(a) Existing soil moisture content is 20%
(b) Field capacity is 30%
(c) Dry unit wt of soil is 15.20 kN/m³
(d) Effective root zone depth is 90 cm
(e) Water application efficiency is 60% at head to 85% at tail end of field, and
(f) Conveyance efficiency of water course is 90%

If supply of water to water course is at 30 l/s for 12 hrs. only, find interval of irrigation for crop having evapotranspiration as 5mm/day. Also find number of field plots irrigated per day if 30 has of command area is constituted by field plots. 10

2(a) What do you mean by canal loss? Explain caused canal losses with their remedial measures to reduce it. Explain the advantages of canal lining. 2+3+3

(b) Explain components of cross section of irrigation and drainage channel with neat sketches where applicable. 8

3(a) Explain design considerations for fish ladder in details. Explain also Lane's weighted seepage creep theory for design of head works. 4+4

(b) The Design discharge of a branch canal in Sikta irrigation project is 50 m³/s at a longitudinal slope of 1/3000 slope. Find the trapezoidal channel with side slope of 1:2 (H:V) using Kennedy's theory for the canal taking Kutter's n = 0.025 and critical velocity ratio m = 1.1. 8

Contd. ...

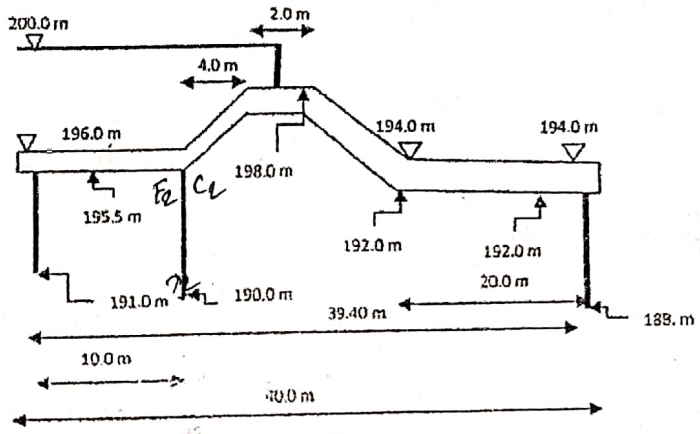
4(a) Define water logging condition of soil with its causes of water logging. Write down the remedial measures to reclaim the water logged areas. 3+3

(b) Design a cross regulator for following data: 10

Discharge through cross regulator 100 m^3/s
FSL of upstream of the cross regulator 218.10 m
FSL of downstream of the cross regulator 217.90 m
Crest level of the cross regulator 216.00 m
Bed width canal upstream of the cross regulator = 45 m
Bed width canal downstream of the cross regulator = 40 m
Depth of water at upstream of the cross regulator = 2.50 m
Depth of water at downstream of the cross regulator = 2.50m
Permissible exit gradient = 1/6

5(a) Why water management is important for sustained irrigation system, explain critically. 4

(b) Using Khosla's theory, find the seepage pressure head at the key points of the diversion head works section as shown in figure given below. Check the sufficiency of the thickness of concrete (S.G. 2.4) provided at the mid section of downstream launching apron of 20 m long. Take slope correction factor for slope 2:1 (H:V) = 6.5 12



6(a) Write short notes on any TWO 4+4

(i) canal alignment
(ii) Aqueduct
(iii) Irrigation Development Policy 2070

(b) Write the procedural steps in spur design. 8

PURBANCHAL UNIVERSITY
2014

B.E. (Civil)/Seventh Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG465CI: Irrigation Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume missing data if any suitably.

Answer FIVE questions.

1(a) What are the irrigation systems that exists in Nepal? Explain development of irrigation in Nepal. 8

(b) A branch irrigation canal was designed in Bagmati Irrigation project as per the given data:

Critical velocity ratio = 1.40, Bed width = 4.50m, Side slope = 45° and Free board = 0.50m. Find the canal flow discharge capacity at the flow depth of 1.45m. 8

2(a) Differentiate between permeable and impermeable groynes. 4

(b) Design and sketch Bell Bund for irrigation headwork's for the discharge of 5600 cumec. Given the average mean diameter of sediment particle= 0.18mm.

The river bed level =205.0m and HFL=208.5m. Find the length of Launching apron. Assume any other data suitably if required. 12

3(a) What are different types of canal outlets? Explain briefly the functions of modular outlets. 6

(b) Using Khosla's theory, find total length of floor of a canal Head regulator for the design flow of 35cumec. Overall waterway width = 20m, maximum seepage Head =7.85m, depth of D/S sheet pile below floor = 8.5m, Safe exit gradient Ge = 1/6 and silt factor (f)= 1.25. 10

4(a) What are the major causes and ill effects of water logging? Suggest preventive measures to avoid water logging. 6

Contd. ...

(b) Compute the balancing depth of a canal section having bed width of 12m, side slopes 1H: 1V in cutting and 2H:1V in filling. The bank embankments are kept 2.5m above the existing ground level and the top width of banks=2.5m. 10

5(a) What are mechanisms of sediment transport in a canal? What do you mean by Regime? 4

(b) Design a trapezoidal shaped concrete lined canal for the following data: Discharge (Q) = 22cumec, Canal Bed slope =1:1500, Side slope = 1.5H:1V The Manning's roughness coefficient of lined canal= 0.015. The limiting velocity =1.75m/sec. 12

6. Answer any two questions: 2×8=16

(a) Prove that the perimeter P in Lacey's canal design is directly proportional to the square Root of the given discharge.

(b) Method of irrigation

(c) Difference between Kennedy's and Lacey's theory

PURBANCHAL UNIVERSITY
2011

B.E. (Civil)/Seventh Semester/Final
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG465CI: Irrigation Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume missing data if any suitably.

Answer FIVE questions.

1(a) Write down the function of irrigation. Explain briefly the history of irrigation development in Nepal. Write down the present status of irrigation development. 2+2+4

(b) Maize is to be grown in a field having a field capacity equal to 27% and the permanent wilting point is 14%. Find the storage capacity in 85cm depth of the soil, if the dry unit weight of the soil is 14.85 KN/M³. If irrigation water is to be supplied when the average soil moisture falls to 19%, find the water depth required to be supplied to the field if the field application efficiency is 75%. What is the amount of water needed at the canal outlet if the water lost in the water-courses and the field channels is 15% of the outlet discharge? 3+3+2

2(a) List out the various methods of applying water in irrigation fields. Explain any one of them. 3+5

(b) Write short notes on: 4+4
(i) Lacey's theory
(ii) Khosla's theory

3(a) Derive the expression for the discharge (q) per unit length of sub-surface drainage. 8

(b) Design a channel carrying a discharge of 35 cumecs with critical velocity ratio and manning's rugosity coefficient equal to 1.0 and 0.025 respectively. Assume bed slope equal to 1 in 3500. Use Kennedy approach for design having side slope of the channel is 1: 2 (H:V). 8

Contd. ...

PURBANCHAL UNIVERSITY
2012

B.E. (Civil)/Seventh Semester/Final
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG465CI: Irrigation Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume missing data if any suitably.

Answer FIVE questions.

1(a) Define irrigation and explain its necessity in country like Nepal. 4

(b) Write down the benefits that can be obtained from irrigation projects. 4

(c) The following data pertains to healthy growth of a crop 8

(i) Field capacity = 30%

(ii) Permanent wilting point = 12%

(iii) Dry density of soil = 1400 kg/m³

(iv) Effective depth of root zone = 80 cm

(v) Daily consumptive use of water = 10mm

If the moisture content shouldn't fall below 25% of the available moisture for healthy growth of crop, determine the irrigation interval in days. Also, determine irrigation depth on the field if water application efficiency is 80% for plot area of 4 hectares.

2(a) Work out the economics of lined canal. 6

(b) Design an irrigation channel to carry 45 cumecs of discharge, The channel is to be laid at a slope of 1 in 3500. The critical velocity ratio for the soil is 1.1. Use Kutter's rugosity coefficient as if canal is fairly maintained. 10

Contd. ...

3(a) Draw a neat layout of diversion headworks and indicate the various components of the system. Write down the main functions of each component. 4+6

(b) Explain the types an suitability of drop structures. 6

4. Design an aqueduct to carry water of a conal over a drainage with following data. 16

Canal

Full supply discharge = $30m^3/s$

Bed width of canal = 18m

Bed level of canal = RL 211.8m

Full Supply level = R.L. 213.3m

Depth of Water in canal = 1.5m

Trapezoidal canal section with $1^1/_2$ H: 1v slopes

Drainage

High flood discharge = 245 m3/s

High flood level = 209.8 m

High flood depth = 2.4 m

General ground level = 212.3 m

5(a) What are the causes of water logging and its effects. Suggest the preventive majors to avoid land from water logging. 4+4

(b) What is river training? Explain the different types of river training works with neat sketches. 1+7

6. Write short notes on any FOUR: 4x4

(i) Operation and maintenance of Irrigation System.

(ii) Cross Regulator and distributor head regulator

(iii) Flood Control

(iv) Requirements of good module

(v) Sprinkler irrigation

4(a) Explain about the operation and maintenance of irrigation system in Nepal.

(b) Design a concrete lined channel to carry a discharge of 4 cumecs at a bed slope of 1 in 6000. The side slope of the channel is 30° to vertical and Manning's rugosity coefficient may be taken as 0.015. Assume the limiting velocity in the channel as 2.5 m/s.

5. Design a canal fall for the following data:

Design width of canal	= 3.2 m
Drop height	= 1.5 m
Discharge	= 4 cumecs
Bed slope of canal	= 1:2500
Side slope of canal	= 1:1

Assume other suitable data if required.

6(a) Explain about the design considerations of a guide bunds

(b) What is cross drainage works? List out the different type C/D works. Explain any one of them with neat sketches.

A : y(B + y0 + y cot θ)

B : y(B + 2y0 + 2y cot θ)

PURBANCHAL UNIVERSITY
2018

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG362CI: Foundation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

5×16=80

Answer FIVE questions.

1(a) A second ring road is to be constructed in Kathmandu valley. You are a geotechnical engineer and you have to do the site investigation. Discuss the methods, soil samples and different tests that may be used. 8

(b) What are the types of foundations? Differentiate between shallow and deep foundations. What are different stages of site investigations? Discuss briefly. 2+2+4

2(a) Derive the active earth pressure of cohesive soil using Rankine's Theory. Also enlist Rankine's Assumptions. 6+2

(b) A circular Isolated footing with its 2m base diameter carries load to a depth of 1.5 m in sand. The saturated unit weight of sand is 20 KN/m^3 and unit weight above the water table is 17 KN/m^3. Determine the safe load it can carry If the water table is 3m below the ground surface. Also determine the change in the safe load it can carry if the water table is at 2m below ground level. Take factor of safety as 3. 8

3(a) Enlist the assumptions of Terzaghi's bearing capacity theory. Derive its bearing capacity equation. 2+6

(b) A frictionless wall of 6 m height retains soil with dry unit weight of 17 KN/m^3 and its cohesion is 10 KN/m^2. The water table is at 5m below the ground surface. Determine the total active thrust on wall after formation of tension crack. Take saturated unit weight 20 KN/m^3. 8

Contd. ...

4(a) What are the different types of mat foundations? Discuss about one of them. What is floating foundation? What are the factors affecting the depth of the spread foundation. 2+3+1+2

(b) A circular concrete pile with diameter of 0.3m and 15m long is used. There is sand with dry unit weight of 17 KN/m^3 and internal frictional angle of 30° upto 5m depth below the ground surface. After 5m depth there is clay with unit weight of 20 KN/m^3 and unconfined compressive strength of 100 KN/m^2. Water table is at the depth of 5m below the ground surface. Determine the ultimate load that the pile can carry. Take k=1 and α=0.6. 8

5(a) What are the methods of soil stabilization? Discuss about any one of them. Draw a neat figure showing the various components of the well foundation. 1.5+2.5+4

(b) Determine the depth of embedment and force in the tie rod of an anchored sheet pile wall retaining soil bank of height 6m. The tie rod is located 1.2m below the top of the wall. The backfill and the soil below the dredge line is cohesionless. Take internal frictional angle be 32° and unit weight of 19 KN/m^3. 8

6. Write short notes on any FOUR: 4×4=16

(a) SPT test

(b) Proportioning of spread footing

(c) Negative skin friction

(d) Pile load test

(e) Bearing capacity of pier in clay

(f) Coffer dam

Dhruv yadav. (PUSET)

PURBANCHAL UNIVERSITY
2017

B.E. (Civil)/Sixth Semester/*Final*
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG362CI: Foundation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

5×16=80

Answer FIVE questions.

1(a) Mention different stages in site investigation along with its objectives. 8

(b) A masonry gravity walls as seen Fig. 1(b) is designed to support cohesion less soil. The unit weight of masonry wall is 23.4 kN/m³. The soil at the front and back of the wall is the same and the properties are given in the figure. Calculate the safety factor of the wall against the overturning assuming 50% of passive resistance is mobilized. 8

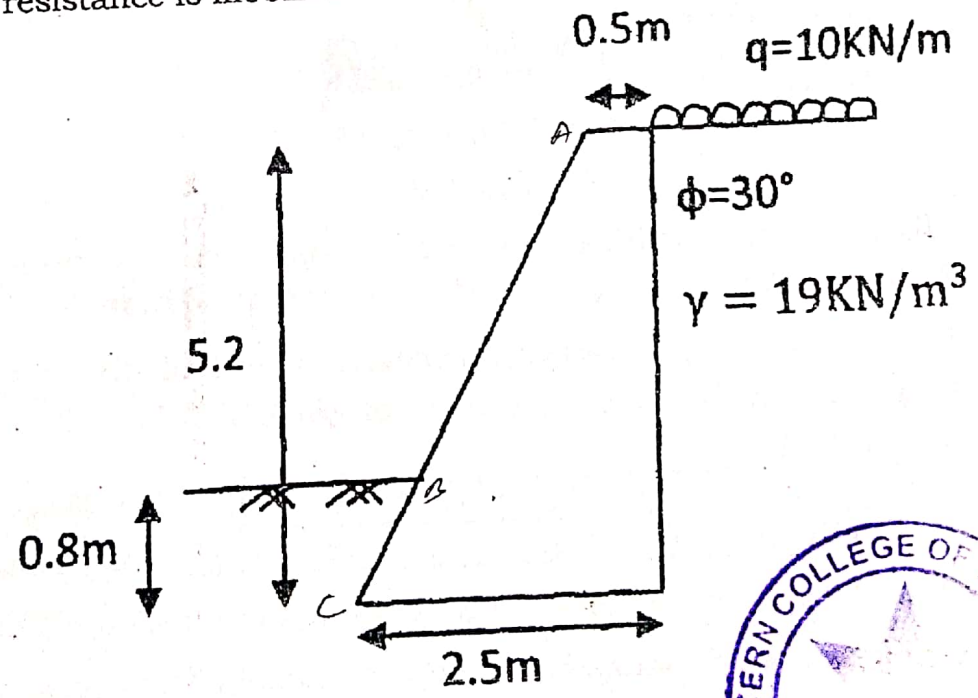


Fig. 1(b)

Contd. ...

2(a) Derive the Coulomb's wedge expression for active case and what are the basic assumptions made by Coulomb to derive his wedge theory? 6+2

(b) Compute the results of Hansen and Meyerhof bearing capacity formulas to the results q_{ult} of a field test that took a rectangular footing to failure when the load reached 1863 kN. Given B= 0.5m, L= 2m, c= 0, ϕ= 46°, y'= 9.31 kN/m³. 8

Φ	Nq	Ny	for
46°	158.5	244.65	Hansen
46°	158.5	328.73	Meyerhof

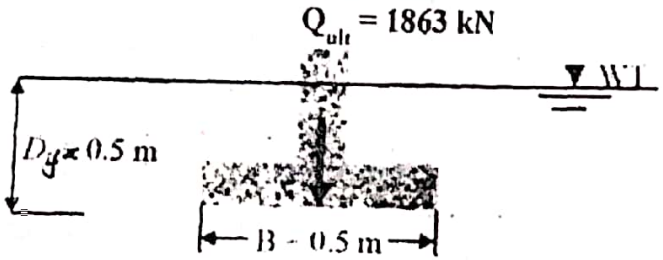


Fig. 2(b)

3(a) What are the conditions for the suitability of mat foundation? Also describe the design procedure of mat foundation. 2+6

(b) Determine ultimate carrying capacity of pile of dia. 0.3m and length 10m driven into sandy soil of given SPT data. Take γ= 17 kN/m² and ϕ= 30°. 8

N-value	-	10	12	12	18	18	20
Depth (m)	0	1.5m	3m	4.5m	6m	9m	12m

4(a) Describe the components of well foundation with neat sketch. 8

(b) Using free earth support method, determine the actual/design depth of embedment and force in the tie rod of an anchored sheet pile wall retaining soil back height 8m. The tie rod is 1.2m below the top of the wall. The back fill and the soil below the dredge line is Cohesionless. Take ϕ'= 33° and γ= 17 kN/m³. 8

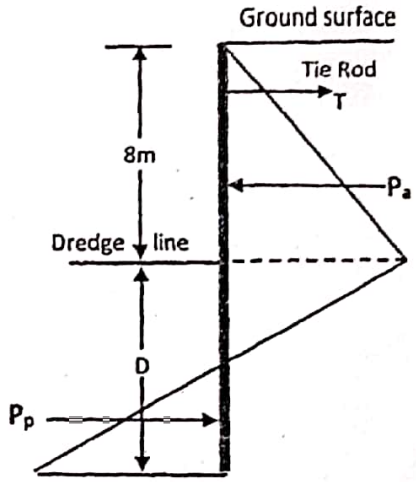


Fig. 4(b)

5(a) What are the various methods of removing ground water from construction sites? Describe three prominent methods of foundation soil stabilization. 4+4

(b) A group of 9 piles with 3 piles in a row was driven into a soft clay extending from ground level to a great depth. The diameter and the length of the piles were 30 cm and 10m respectively. The unconfined compressive strength of the clay is 70 kPa. If the piles were placed 90cm center to center, compute the allowable load on the pile group on the basis of a shear failure criterion for a factor of safety of 2.5. 8

6. Write short notes on any FOUR: 4×4=16

(a) Types of footing

(b) Proportioning of footing for uniform settlement

(c) Pier foundation

(d) Coffer-dam

(e) Settlement of pile foundation

PURBANCHAL UNIVERSITY

2017

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG362CI: Foundation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions. **5×16=80**

1(a) What are the objectives of soil exploration. Discuss types of soil investigation? 4+4

(b) Determine Rankine's active pressure per unit length of the wall [fig 1]. Water table is at level 3m from base of the wall. 8

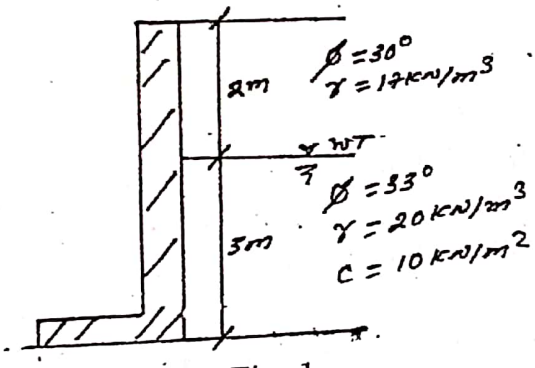


Fig. 1

2(a) Derive the expression for Terzaghi's ultimate bearing capacity of strip footing for general shear failure stating the assumptions made during derivation. 8

(b) A strip footing of width 1.2m with its base at 2m belowground surface. Take c=12kn/m2, unit wt of soil γ=18kn/m3;γsat=21 kn/m3. Nc'=4/Nq'=8/Nγ'=16. Determine ultimate bearing capacity if [a] Water table is at 1m below ground level. 8

3(a) Describe active; passive and at rest condition of soil pressure. Describe different methods of soil stabilization. 4+4

(b) Check stability of masonry retaining wall against sliding, overturning & bearing [fig2]. Safe bearing capacity of soil is 200kn/m2 & coefficient of friction is 0.4. 8

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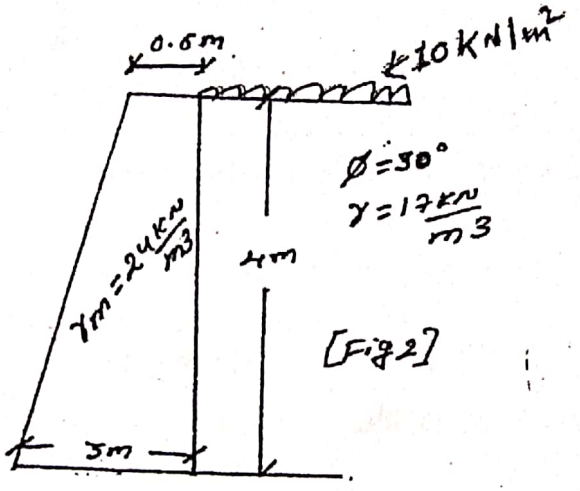


Fig. 2

4(a) Write down the procedure to design Raft foundation by conventional Rigid method. 8

(b) In which condition negative skin friction is developed in pile foundation? How pier foundation is constructed? Describe. 4+4

5(a) Design friction pile group to carry load of 2000KN including wt. of pile cap at site where soil is uniform clay to depth of 20m under lain by rock. Av. Unconfined compressive strength of soil is 60kn/m2. Take factor of safety=3 & adhesion factor = 0.6. 8

(b) Determine depth of embedment and force in tie rod of an anchored sheet pile wall retaining soil bank of 4m height. The tie rod is located at 1m below top of wall. Take soil is cohesion less with $\phi=30°$ & unit wt.= 1 8kn/m3. 8

6. Write short notes on any FOUR: 4×4=16

(a) Types of Coffer Dam

(b) Difference between Rankine and Coulomb earth pressure theory.

(c) SPT

(d) Types of Caisson foundation

(e) Criteria for choice of Footing type

(f) Plate load test.

PURBANCHAL UNIVERSITY
2016

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG362CI: Foundation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions. 5×16=80

1(a) Describe SPT in detail. What are the corrections to be applied? 5+3

(b) Determine the passive pressure on the retaining Wall shown in Fig. 1(b). Take Υ_w=10 kN/m^3. 8

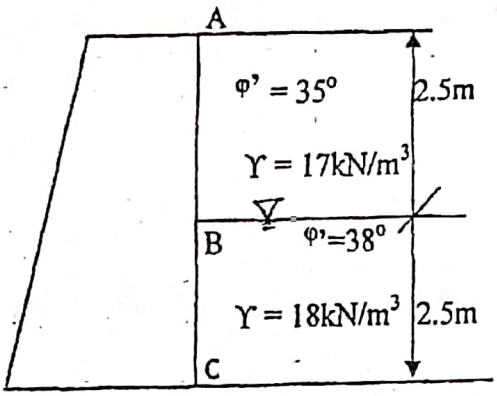
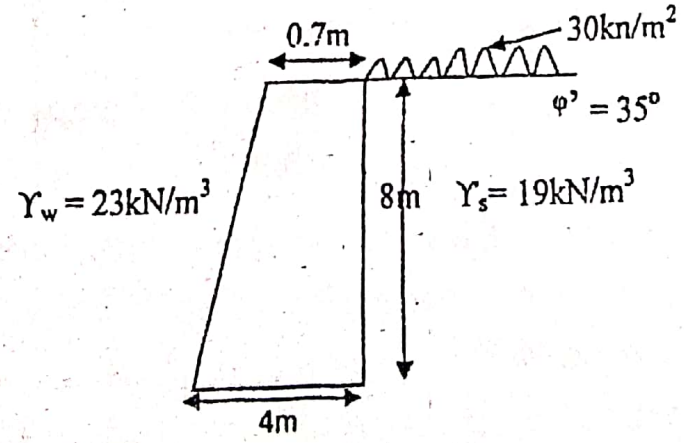


Fig. 1(b)

2(a) Derive the expressions for Coulomb's active pressure in cohesionless soils. 8

(b) Check the stability of the gravity retaining wall shown in Fig. 2(b). Take allowable soil pressure equal to 500kn/m2 and μ=0.7. 8



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3(a) Discuss the effect of water table on the bearing capacity of the soil with derivation. 8

(b) A square footing of 2m width and 1.6m depth is to support a column load. Calculate the safe load in local shear assuming c=20 kPa, ϕ=30°, γ=18 kN/m³. For ϕ=30°., N_c=34, N_q=41, N_γ=40.5. 8

4(a) The plan of a Raft foundation with 9 columns is shown in Fig. 4(a). Assuming that the Raft is rigid, determine the soil pressure distribution. All the columns are of size 0.6m×0.6m. 8

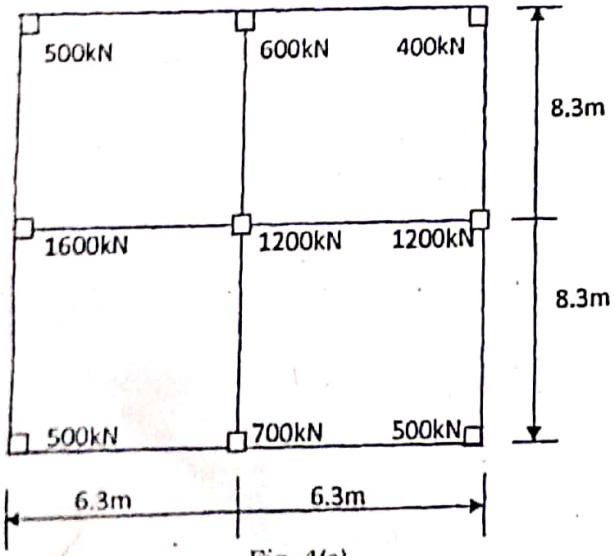


Fig. 4(a)

(b) What is negative skin friction? Compare advantages and disadvantages of pile foundations. 8

5(a) A concrete pile 40cm diameter, 9m long, is driven through a 6m thick layer of silty sand (Φ=20°, γ=17 kN/m³) overlying a dense layer of sand (Φ=35°, γ=19.5 kN/m³). If the water table is at the ground surface, estimate the safe load. (F.S.=3). Take K=1 and δ= 0.75φ. 8

(b) A cantilever sheet pile retains soil to a height of 6m. Find the depth to which the pile should be driven assuming two-third of the theoretical passive resistance is developed on the embedded length. (Φ=30°, γ=19 kN/m³). Use approximate method. Refer Fig. 5(b). 8

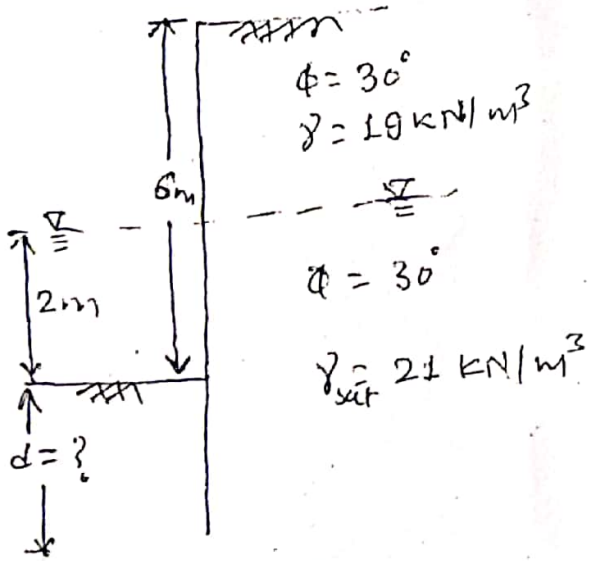


Fig. 5(b)

6. Write short notes on any FOUR: 4×4=16

(a) Preparation of site investigation reports
(b) Well foundation
(c) Soil Stabilization
(d) Rankine Earth Pressure Theory
(e) Function of Piers
(f) Function of foundation

PURBANCHAL UNIVERSITY
2015

B.E. (Civil)/Sixth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG362CI: Foundation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions. **5×16=80**

1(a) List out the factors affecting the choice of foundation. What are the major objectives of soil exploration? 3+5

(b) A retaining wall of 8.0m high has a smooth vertical back. It supports a horizontal backfill with angle of internal friction of 35°, cohesion of 10KPa. The water table is at a depth of 3.0m below the surface of backfill. The unit weight of backfill is 17KN/m^3 above the water table. The backfill supports and surcharge of 20KPa. Determine the magnitude and point of application of active earth pressure. 8

2(a) Derive the expression of passive lateral pressure using Rankine's theory for (c, ϕ) soils. 8

(b) A circular footing is to be designed to carry a load of 6000 kN. If the depth of foundation is 1.6m, determine the suitable size of foundation with a factor of safety 3. The water table is at the foundation level. Take ϕ=20°, N^1_c=11.8, N^1_q=3.9, $N^1\gamma$=1.7, γ=16 kN/m^3, γ_{sat}=20 kN/m^3. Use Terzaghi's local shear failure theory. Take c=20 kN/m^2. 8

3(a) Ktm valley (metropolitan city) is planning to construct an outer ring road in the valley. For the purpose, a detailed soil survey has to be conducted. As a geotechnical engineer, what will be your recommendation regarding the types of sample to be collected during subsurface exploitation? What kind of tests you are going to perform with the recommended soil samples in the laboratory for the design of ring road? 8

Contd. ...

(b) What do you mean by combined footing and where do you provide it? Discuss the procedure for the design of the trapezoidal footing. 8

4(a) Explain the procedure of conducting the standard penetration test (SPT) in the field. Elaborate its importance. 8

(b) A concrete pile 30cm diameter is driven into a medium dense sand (ϕ=35°, γ=20 KN/m^3, K=1.0, tanδ=0.70) for a depth of 10m. If water table is 2m below the ground surface, estimate the safe load taking a factor of safety of 3. 8

5(a) What do you mean by coffer dam? What are the various methods of removing ground water from construction sites? 2+6

(b) A 5m deep excavation of trench is carried out in sand and supported by cantilever sheet pile. The water table at both sides of the sheet pile is found at the bottom of the excavation. The hulk unit weight of sand is 18KN/m^3 above the water table and 20kN/m^3 below the water table. ϕ=30°, determine the required depth of embedment. 8

6. Write short notes on any FOUR: 4×4=16

(a) Soil stabilization
(b) Combined footing
(c) Factors affecting bearing capacity of soil
(d) Standard Penetration Test (SPT)
(e) Types of pile
(f) Caisson foundation

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Sixth Semester/*Chance*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG362CI: Foundation Engineering *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions.

1(a) As a geotechnical engineer, how will you determine the depth of ground water table in soils of: (i) high permeability and (ii) low permeability? Elucidate plate loads test for investigating soil. 4+4

(b) Use Culmaan's graphical procedure to determine the Coulomb's active force (P_a) per unit length of the wall in the following case [Figure. 1(b)]: H=5.5 m, H_1= 6.5 m, γ=1680 kg/m^3, β=80°, n=1, φ=30°, δ=30°. (Use graph paper if necessary). 8

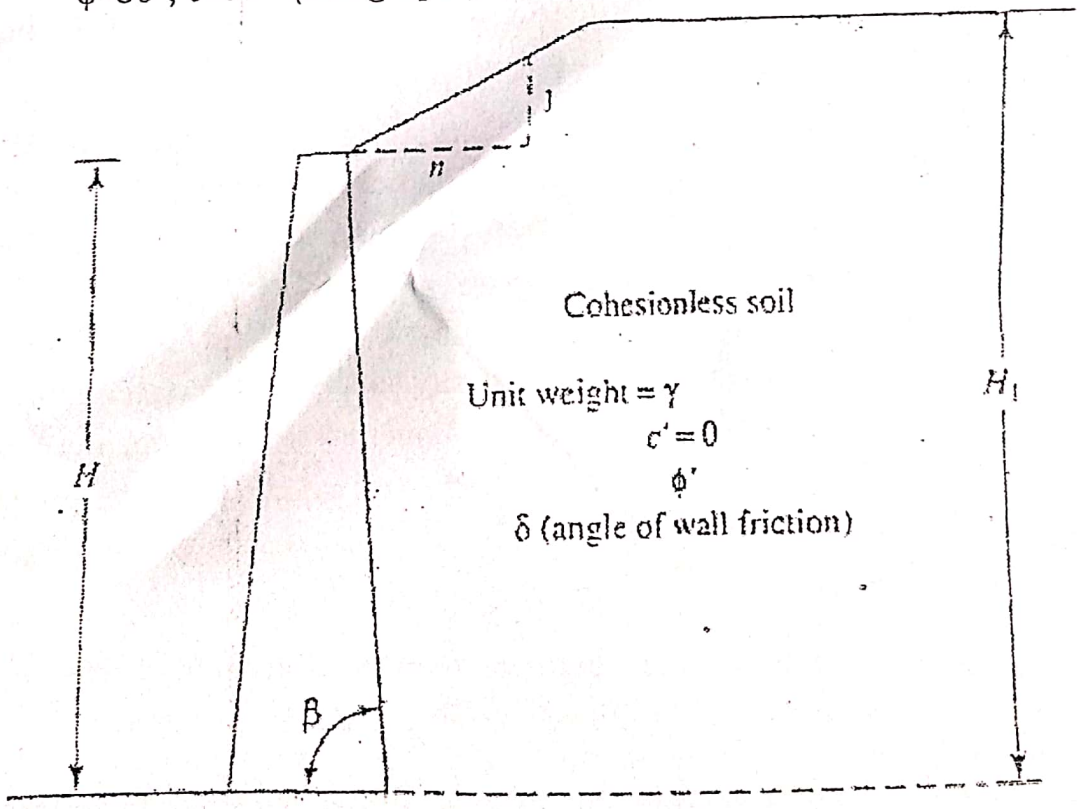


Fig. 1(b)

Contd. ...

2(a) Explain the earth pressure at elastic and plastic equilibrium on the basis of Mohr-Coulomb theory. Also describe the strains associated with Rankine's states. 5+3

(b) A square foundation of size 1.6m×1.6m is to be built at a depth of 1.6 m of a uniform clay strata having the following properties: $\varphi=0°$, $c=32$ kN/m² and $\gamma=19.2$ kN/m³. Find the safe load the foundation can carry with a factor of safety of 2.5. Use Terzaghi's bearing capacity theory ($N_c= 5.71$, $N_q=1$ and $N_\gamma= 0$). If the ground water table subsequently rises from a depth of 5m to the ground surface, find the load carrying capacity of the foundation. Take saturated unit weight of the soil = 19.74 kN/m³ and submerged unit weight of the soil is 9.93 kN/m³. 4+4

3(a) Briefly explain design procedure of spread footing on firm soil above soft layers. Write in you words, the types of mat foundation and their uses. 4+4

(b) A group of pile has to support a vertical axial load of 2500kN. The piles are driven into clay and have a length of 11m. The thickness of clay stratum is 16 m and it is followed by rock. The saturated unit weight of clay is 20kN/m³ and the cohesion is 30kN/m². The clay is normally consolidated and has a liquid limit of 70%. Its specific gravity is 2.65. The water table is the ground itself. Assuming pile diameter as 350 mm, the adhesion coefficient α as 0.50 and factor of safety as 3, design the pile group and calculate the settlement of the pile group. Neglect end bearing resistance and take $e_0=1$. 4+4

4(a) Categorize common types of deep foundation with neat sketches. Explain the construction of pier foundation in brief. 3+5

(b) The plan of a raft foundation with 12 columns is shown in Fig. 4(b). Assuming that the raft is rigid, determine the pressure distributions at four corner points of raft foundation: Take the size of column as 350mm×350mm. 8

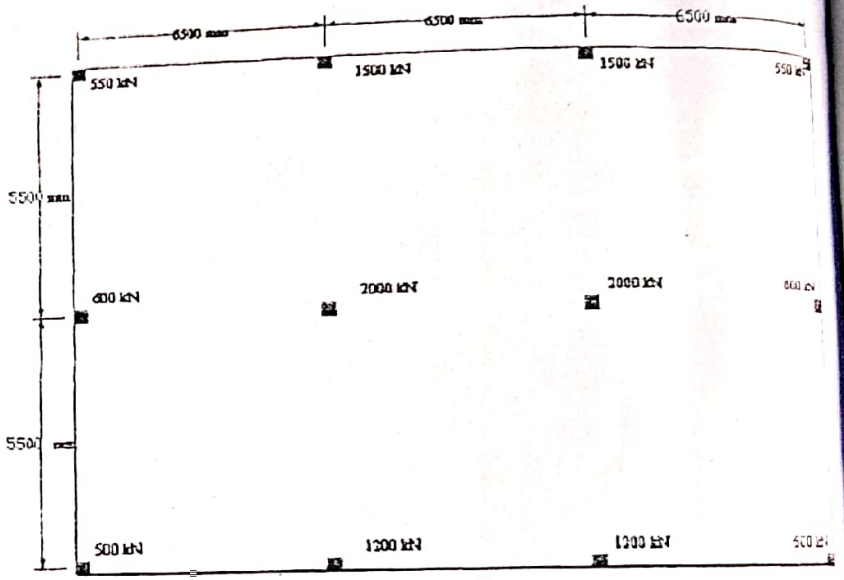


Fig. 4(b)

5(a) What is caisson foundation? Explain in brief the design aspects of caisson foundations. 1+7

(b) A cantilever sheet pile is to be installed in cohesion less soil of unit weight 20 kN/m³ and $\phi= 30°$. The height above dredge level is 6 m and water level above the dredge level is 3m. Using the simplified method, estimate the depth of penetration needed for sheet pile for stability. Find also the theoretical maximum bending moment in the pile. 4+4

6. Write Short note on any FOUR: 4×4=16

(a) Soil/foundation interaction

(b) Preparation of site investigation report

(c) Damage, alignment and effect of pile driving

(d) Design of braced coffer dams

(e) Influence of wall friction in failure surface

PURBANCHAL UNIVERSITY
2015

B.E. (Civil)/Sixth Semester/ *Chance*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG359CI: Foundation Engineering *(Old Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions.

1(a) What are the factors affecting the choice of a foundation? Explain how standard penetration test is carried out in the field. 3+5

(b) Determine Rankine's active pressure per unit length of 5m high wall. The water table is 2m from the base of wall. Backfill is cohesionless above water table and cohesive ($C=10$ kN/m^2) below water table. $\phi=30°$, $\gamma=17$ kN/m^3, $\gamma_{sat}=20$ kN/m^3. 8

2(a) Derive the expression of active lateral pressure using Rankine's theory for c, ϕ soils. 8

(b) A square footing is to be designed to carry a load of 5000 kN. If the depth of foundation is 1.6m, determine the suitable size of foundation with a factor of safety 3. The water table is at the foundation level. Take $\phi=20°$, $C=20$ kN/m^2, $N_c'=11.8$, $Nq'=3.9$, $N_\gamma=1.7$, $\gamma=16$ kN/m^3, $\gamma_{sat}=20$ kN/m^3. Use Terzaghi's local shear failure theory. 8

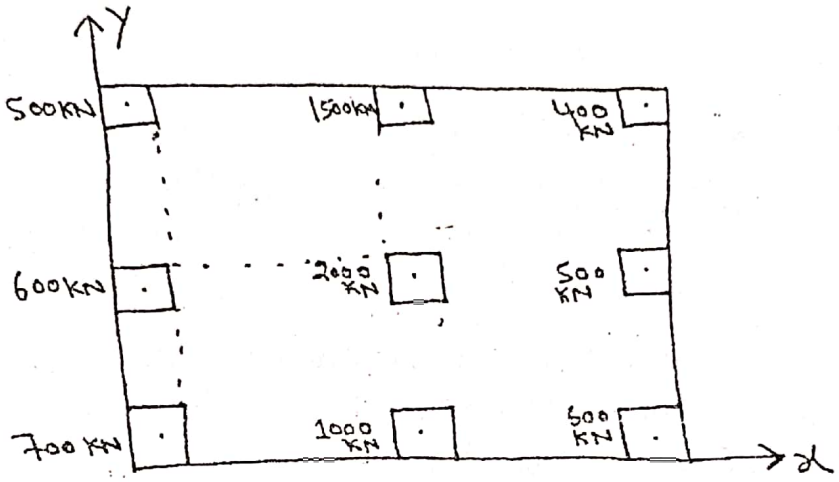
3(a) What do you mean by coffer dam? What are the various methods of removing ground water table from construction sites? 2+6

(b) A 5m deep excavation of a trench is carried out in sand and supported by contilever sheet pile. The water table at both sides of the sheet pile is found at the bottom of the excavation. The bulk unit weight of sand is 17 kN/m^3 above the water table and 20 kN/m^3 below the water table. $\phi=30°$, determine the required depth of embedment. 8

Contd. ...

4(a) Derive the expression for Terzaghi's ultimate bearing capacity of strip footing for general shear failure with assumptions. 8

(b) For the given plan of rigid mat foundation with 9 columns shown in figure. Determine soil pressure at four corners of mat. All the column are of size 0.5m×0.5m. Spacing of column is x-direction is 8m and in y-direction is 6m. 8



5(a) Explain design considerations for caissons. What do you understand by Pandtt's theory? 5+3

(b) A group of 16 piles (diameter= 30cm, length=12m, centre to centre spacing=1m) arranged in square patterns passing through a fill (thickness=2m) overlaying a soft clay deposit (thickness=5m) which is consolidated under the fill load and rests in stiff clay strata. All strata are saturated. The soil properties of different strata are:

For fill: γ =15 kN/m^3, C_u=10 kN/m^2, ϕ=0, α=0.60

For soft clay: γ =17 kN/m^3, C_u=20 kN/m^2, ϕ=0, α=0.40

For stiff clay: γ =20 kN/m^3, C_u=50 kN/m^2, ϕ=0, α=0.50

Estimate the safe load of the pile group, using a factor of safety 3. 8

6. Write short notes on any FOUR: 4×4=16

(a) Foundation Stabilization (b) Strap footing

(c) Plate load test (d) Negative skin friction of pile

(e) Factors affecting bearing capacity of soil

PURBANCHAL UNIVERSITY
2014 (New)

B.E. (Civil)/Sixth Semester/*Final*
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG362CI: Foundation Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

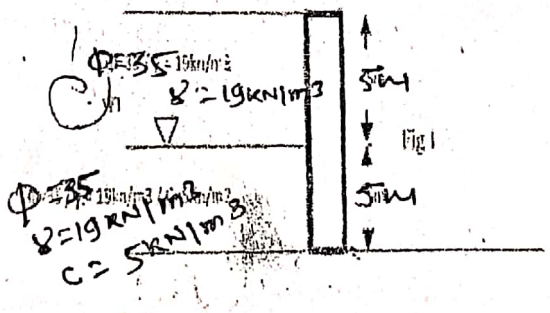
Answer FIVE questions.

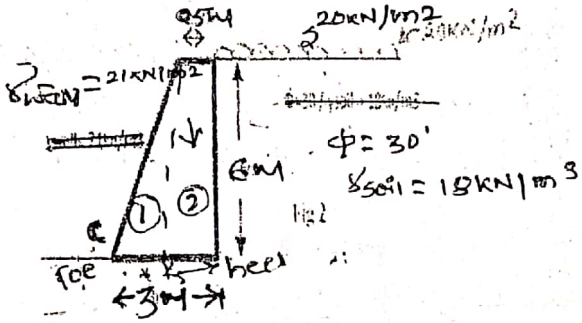
1(a) Describe Rankine's earth pressure theory with his assumptions Derive the relationship of lateral earth pressure for Rankine active state of plastic equilibrium for cohesive soil. 8

(b) Determine Rankine's active pressure per unit length of the wall (figl). Water table is at level 5m from base of the wall. 8

2(a) Explain site investigation with the various stages involved. 8

(b) Check stability of masonry retaining wall against sliding, overturning & bearing (fig2). Safe bearing capacity of soil is 300kn/m² & coefficient of friction is 0.6. 8



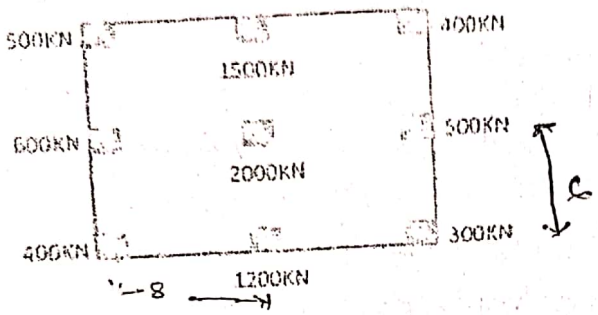


3(a) Derive the expression for Terzaghi's ultimate bearing capacity of strip footing for general shear failure stating the assumptions made during derivation. 8

(b) A strip footing of width 1.2m with its base at 1m belowground surface. Take C= 15Kn/m². unit wt of soil γ=18kn/m³ γsat=20kn/m³, Nc'=4; Nq' = 8 ; Nγ' =16. Determine ultimate bearing capacity if (a) Water table is at base of footing. (b) if Water table is at ground level. 8

Contd. ...

4(a) For the given plan of rigid mat foundation with 9 column, determine soil pressure at four corner of mat. All the column are of size 0.5m x 0.5m. Spacing of column in X-direction is 8m & in Y-direction is 6m. 8



(b) Explain various types of pile. (8)

5(a) Design friction pile group to carry load of 3000KN including wt. of pile cap at site where soil is uniform clay to depth of 20m under lain by rock. Avg. Unconfined compressive strength of soil is 70Kn/m². Take factor of safety=3 & adhesion factor 0.6. 8

Neelkanth Pg-214

(b) Determine depth of embedment and force in tie rod of an anchored sheet pile wall retaining soil bank of 3m height. Take soil is cohesion less with ϕ=30 & unit wt.= 18Kn/m³. Use simplified method. 8

6. Write Short note on any FOUR 4×4 = 16

(a) Soil stabilization.

(b) Caisson foundation.

(c) Plate load test

(d) Pile load test

(e) CPT Test

(f) Types of Coffer Dam.

PURBANCHAL UNIVERSITY
2014

B.E. (Civil)/Sixth Semester/*Chance*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG359CI: Foundation Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions.

1(a) What is the function of foundation and what are the factors affecting the choice of a foundation? 1+3

(b) What are the objectives of site investigation? Explain. 6

(c) What is bore hole log and what are the necessary information to be filled up in the borehole log? 6

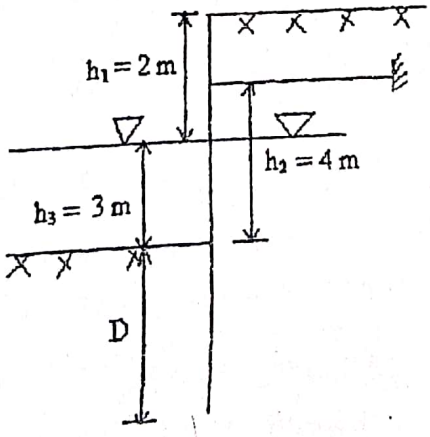
2(a) A retaining wall with a height 6m retains a clay backfill having a unit weight of 16.5 kN/m^3, and undrained shear strength 20 kN/m^2. For the undrained condition (Φ=0) of the backfill, determine: 8

(i) Maximum depth of the tensile crack

(ii) Passive force before the tensile crack occurs

(iii) Passive force after the tensile crack occurs

(b) Determine the depth of embedment and the force in anchor rod of the anchored bulkhead shown in Figure below. The backfill and the soil below the dredge line is sand, having the following properties: G=2.6, e=1 and Φ=30°. Solve the problem by free earth support method. 8



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3 a b

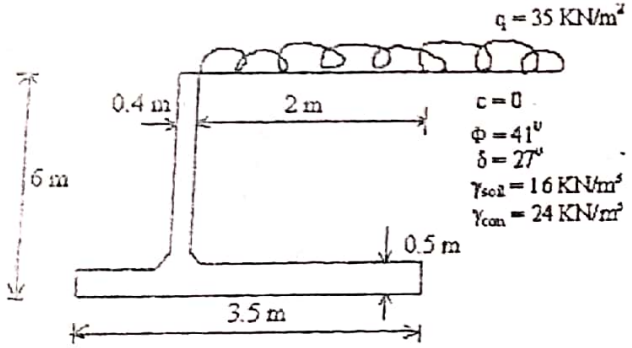
6 a

5 c

5 a

Contd. ...

5(a) Determine the maximum and minimum pressure under the base of the cantilever retaining wall as shown in figure and also the factor of safety against sliding and overturning. The approximate shear strength parameters for the soil are c=0, Φ=41°. The unit weight of soil and concrete are 16 kN/m³ and 24 kN/m³ respectively. The water table is below the base of the wall. Take δ=27⁰ on the base of the wall. 10



(b) Describe the advantages and disadvantages of drilled pier foundation? 6

(c) A plate load test was conducted with a 30cm×30cm plate at a depth of 1.2m below the ground level, in a cohesive soil Φ=0. The failure was observed at a load of 36kN. The water table was observed to be at a depth of 4.7m below the ground surface. Compute the ultimate bearing capacity for a strip footing, 1m wide, with its base located at the same level as the test plate and in the same soil. Take y=17 kN/m³. Also calculate the safe bearing capacity at factor of safety 3. 6

(b) What are the assumptions made by Terzaghi for his general bearing capacity theory? 4

(c) Describe the design procedure of spread foundation. 6

5(a) A group of 16 piles (diameter=50cm, length=14m, centre to centre spacing=1m) arranged in a square pattern passing through a recent fill (thickness=3m) overlying a soft clay deposit

Contd. ...

(thickness=5m) which is consolidating under the fill load and rests in a stiff clay strata. All the strata are saturated. The soil properties of different strata are:

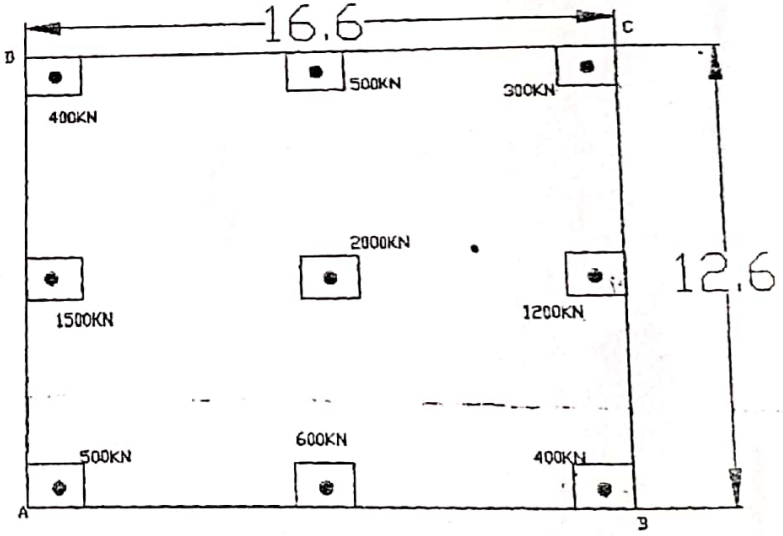
Type of soil	Unit weight	Strength Parameters		Adhesion
	y (KN /m³)	Cu (KN/m²)	Φ	factor (a)
Fill	16	so	0	0.6
Soft Clay	17	20	0	0.4
Stiff Clay	21	70	0	0.5

Estimate the safe load of the pile group using a factor of safety 3. 8

(b) Describe how you select the type of pile foundation if you are given the responsibility. 4

(c) Describe the components of well foundation. 4

6(a) The plan of a mat foundation with 9 columns is shown in figure below. Find the soil contact pressure under the four corners of the raft. All the columns are of size 0.6m×0.6m. 8



(b) What is soil improvement? What properties of foundation soil are improved by soil improvement technique? What do you mean by preloading and mechanical compaction? 8

PURBANCHAL UNIVERSITY
2013

B.E. (Civil)/Sixth Semester/Final

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG359CI: Foundation Engineering

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions.

1(a) Describe methods of site investigation. Briefly explain plate load test. 4+4

(b) A Retaining wall with a smooth vertical back retains cohesion less backfill of 6m height. Take c = 0, φ =28^0, Υ = 16 kN/m^3, Υ_{sat} = 20 kN/m^3. Calculate the magnitude of total thrust against the wall. Assume.

(i) backfill is fully drained but top of wall is restrained against yielding.

(ii) backfill is fully drained and wall is free to yield. 8

2(a) Derive general equation of ultimate bearing capacity for strip footing on the soil given by Terzaghi. 10

(b) A strip footing 1.2m wide is located at a depth of 0.9 m below G.L. Take y = 19 kN/m^3, c = 25kPa, φ = 20^0. Determine the Safe Bearing Capacity, take F.O.S. of 2.5. Assume N_c' = 11.8, N_Υ' = 1.7 and N_q' = 3.9. 6

3(a) What is the major differences between shallow foundation and deep foundation? Describe the types of deep foundation in detail. 2+6

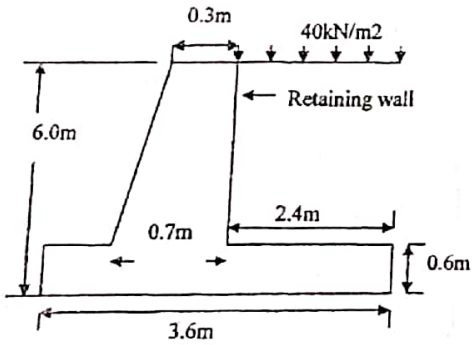
(b) The following data has been obtained from Plate Load Test (PLT) carried out on a 60cm*60cm plate at a depth of 2m below ground level on a sandy soil. Determine the allowable load on a column footing having size 1.5m*1.5m at a depth of 2m from ground level. Take allowable settlement as 20mm for footing. Take factor of safety against shear failure as 2. Use graph paper if necessary. 8

Contd. ...

Pressure intensity (kPa)	70	100	150	200	300	350	400
Settlement of plate, S (mm)	2	4	7.5	11	23.5	34	45

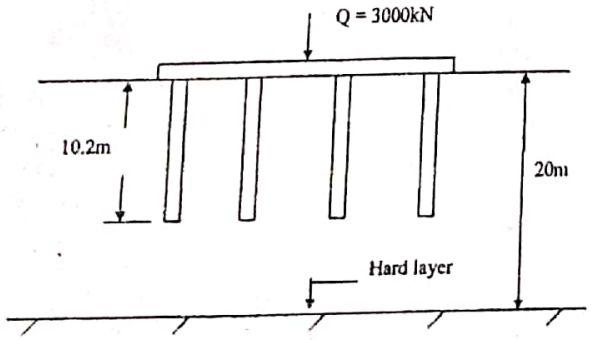
4(a) Define Raft Foundation, write it's type and describe the circumstances on which raft foundation should be preferred. 2+2+2

(b) Check the stability of RCC Retaining wall supporting cohesionless backfill as shown in below fig. Take $\varphi = 34^0$, $\partial = 25^0$, $\Upsilon = 18$ kN/m^3 and allowable bearing pressure of 500 kPa. Unit weight of R.C.C is 25 kN/m^3. 10



5(a) Write short notes on: 4+4
(i) Coffer Dam and it's type
(ii) Spread Foundation

(b) Compute the settlement of the pile group as shown in fig. below where L.L.= 60% & initial void ratio is 0.9. Take effective unit weight of soil as 12 kN/m^3. 8



6(a) Write types of well foundation. Describe the various components (parts) of the open caisson with neat sketch. 2+6

(b) Determine the depth of embedment and force in tie rod of an anchored sheet pile wall retaining soil bank of height 5m. The tie rod is located 1m below the top of the wall. The backfill and the soil below the dredge line is cohesionless. Take $\varphi = 30^0$ & soil unit weight as 18 kN/m^3. 8

PURBANCHAL UNIVERSITY
2013

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All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions.

1(a) Central material testing laboratory had conducted the soil investigation work for a building construction project at Kalimati, Kathmandu. Prepare the typical format of a report to be submitted to the client. Also prepare a typical borehole log format. Explain why a borehole log should be prepared. 8

(b) Sketch a gravity retaining wall showing the lateral pressure distribution and explain all types of stability checks that have to be done. Determine the minimum force and point of application on the retaining wall shown in the figure at the state of plastic equilibrium. Assuming that ground water table is 1m below the ground surface. 8

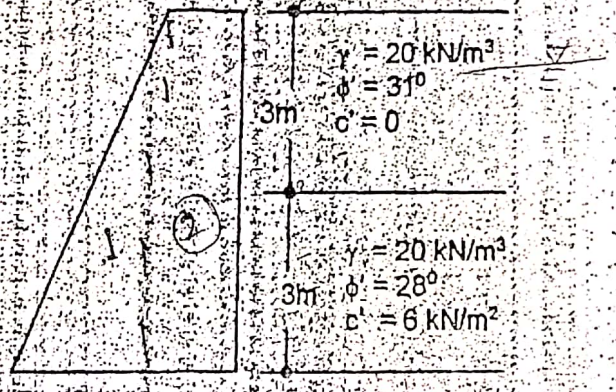

Fig: Q.1 (b)

2(a) Describe the Rankine's earth pressure theory with his assumptions. Derive the relationships of lateral earth pressure for Rankine's active and passive state of plastic equilibrium. 8

(a) Explain the significance of standard penetration test in foundation Engineering. Describe the two corrections applied to SPT value. 8

3(a) Categorize different types of shallow foundations. Describe the various factors that should be considered in the determination of the depth of a shallow foundation. Furnish your answer with sketches. 8

(b) A footing 2.5m square and 0.7m thick is supported by sand with N-value of 30. The surface of ground is 0.8m above the top of the footing and water table is 1.2m below the base. Compute the maximum load the footing can support if the settlement must not exceed 40mm. 8

4(a) It is planned to obtain the values of allowable bearing capacity for clay and sandy soil on the basis of plate load test. Mention how it is possible and also write down the procedure to conduct this test. 8

(b) A foundation of size 2m × 2m is placed at a depth of 2 m in a clay soil. The footing is eccentrically loaded where the eccentricity of load is 0.2m in one direction of the axis of the footing. The undrained shear strength of the soil is 60kN/m² and the unit weight is 20 kN/m³. Determine;

(i) The net ultimate bearing capacity.

(ii) The net safe load of the foundation for a safety factor of 3.0. 8

5(a) Describe the pile types on the basis of mechanism of load transfer. Derive the expression of static load carrying capacity of single vertical pile. 8

(b) A piles group consists of 900 piles is driven into a clay deposit. The piles are arranged in square configuration, i.e. 30 piles in each direction. The centre-to-centre distances between the piles in both directions are 0.6m. The length of the pile is 10m and the diameter is 0.25m. The average undrained shear strength along the length of the pile is 40kN/m² and the adhesion factor is 0.8. Determine the ultimate load capacity of the individual pile. Determine also the ultimate load capacity of the block assuming the pile group behaves as a block. 8

Contd. ...

6(a) What are the various methods of removing ground water from construction sites? Describe three prominent methods of foundation soil stabilization. 8

(b) A 2.5m deep excavation of a trench is carried out in sand and supported by cantilever sheet pile wall. The water table at both sides of the sheet pile wall was found at bottom of the excavation. The bulk unit weight of sand is 18kN/m³ above water table and 20kN/m³ below the water table. The friction angle is 35°. Determine the actual depth of penetration.

PURBANCHAL UNIVERSITY
2012

B.E. (Civil)/Sixth Semester/Final
Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32
BEG359CI: Foundation Engineering

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All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume suitable data if necessary.

Answer FIVE questions.

1(a) Explain about the different types of sampling of soil. What is the requirement of a good sampler? 4+4

(b) Derive Terzaghi's bearing capacity equation. What is the limitation of the Terzaghi's bearing capacity theory. 6+2

2(a) Explain about the Dynamic cone penetration test and static cone penetration test. Give the typical graph for the cone penetration test. 3+3+2

(b) A square footing is to be designed to carry a load of 5000KN. If the depth of foundation is 1. 5m, determine the suitable size of foundation with a factor of safety 3. The water table is at the foundation level. Take $\varphi=25°$, $\Upsilon=16$ KN/m^3, $\Upsilon_{sat}=19$ KN/m^3. Use Terjaghi's theory and assume local shear failure. Take c=20 KN/m^2, $N_c'=14.8$, $Nq'=5.6$ and $N_\Upsilon=3.2$. 8

3(a) Explain about the different types of pile. Compare the piles according to the method of installation with the corresponding advantages and disadvantages 4+4

(b) Determine F.O.S against sliding, overturning and maximum and minimum pressure under the base of the cantilever retaining wall as shown in fig. 3(b). The approximate shear strength parameter for the soil c=0, $\varnothing=41°$. The unit weight of soil and concrete are 16KN/m^3 and 24 KN/m^3 respectively, the water table is below the base of the wall. Take=27° on the base of the wall. Safe bearing capacity of the soil below the base is 500KN/m^2. 8

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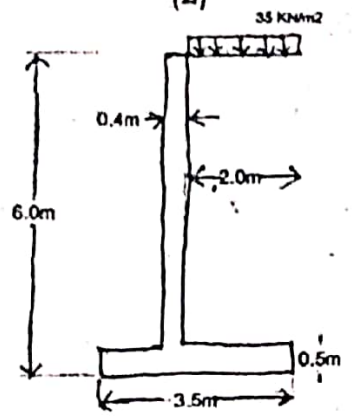


Fig. 3(b)

4(a) What are the difference between Rankine's earth pressure theory and Coulomb's earth pressure theory? Explain about the earth pressure at rest, Active earth pressure and Passive earth pressure. 4+4

(b) The section of a 3×4 group pile in a layered saturated clay is shown in Fig. 4(b). The piles are square in cross section (300mm×300mm). The center to center spacing of the piles is 900mm. Determine the allowable load bearing capacity of the pile group. Use factor of safety equals to 4. 8

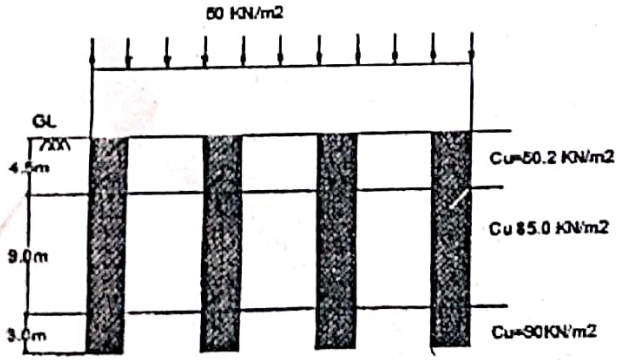


Fig. 4(b)

5(a) What are the different types of coffer dams? 4

(b) What are the measures for rectification of tilts a d shifts in the well foundation? 4

(c) Determine the depth of embedment of the anchored sheet pile shown in Fig. 5(c). Also determine the force in the anchor per metre of the wall. Assume free-earth support condition. 8

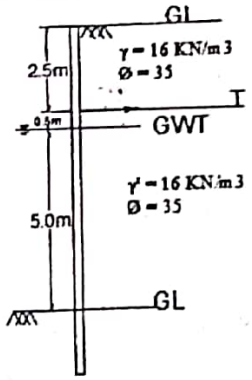
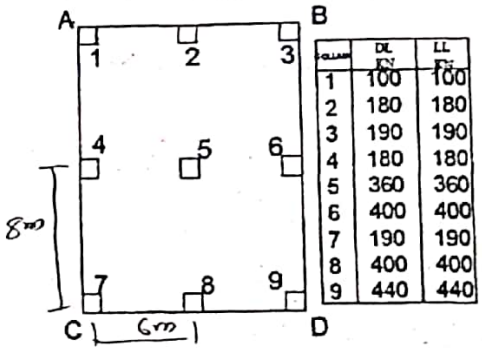


Fig. 5(c

6(a) The plan of a mat foundation with 9 columns is shown in Fig. 6(a) Assuming the mat is rigid, determine the soil pressure distributio at point A, B, C and D if the size of the columns are 0.6m×0.6r and the 6m c/c along x-direction and 8m c/c along y-directio Take the load combination as (1.2DL +0.8LL).



Column	DL KN	LL KN
1	100	100
2	180	180
3	190	190
4	180	180
5	360	360
6	400	400
7	190	190
8	400	400
9	440	440

(6)

Fig. 6(

(b) Write short notes on any TWO: 4

(i) Drainage from open sumps

(ii) Soil Stabilization

(iii) Mat foundation (9)

PURBANCHAL UNIVERSITY
2012

B.E. (Civil)/Sixth Semester/*Chance*
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Answer FIVE questions. Q. No. (4) is compulsory. Assume suitable data if necessary.

1(a) What is the foundation engineering? Define the types of foundations. 4

(b) Determine the depth below the ground surface of the raft foundation (30cm×30cm) to carry a gross load of 150 MN. The soil is carry (Cu=15 KN/m², γ=19 kN/m³). Take the factor of safety of 3. Also determine the depth for a fully compensated foundation. 10+2

2(a) What are the steps followed in design of spread foundation? 4

(b) A retaining wall of 7.25m high has two layers of backfill. The soil supported consists of 4.5m sand (γ= 17.5 kN/m³ ϕ=30°) overlying saturated sandy clay (γ=19.25 kN/m³, ϕ=35°, c=16.6 kN/m²). The ground water table is at the upper surface of the sandy clay. Make a sketch of the distribution of the active pressure on the wall. Calculate the total thrust per meter of the wall. 12

3(a) What are the methods of drilling/Boring? Describe any one of them. 6

(b) A R.C.C column footing square in shape rests 1.5m below the ground level. The total load to be transmitted including the weight of the column is 200 tones. The friction of the footing along the sides is to be neglected and a factor of safety 2 be allowed. If the saturated density of sand be 1.8 gm/ ϕ=33° Nq=32 and Nγ=33. Find a suitable size for the

Check the all stability conditions for a retaining wall as shown in Fig. (4). Assume the other data appropriately. Neglect the passive pressure. 16

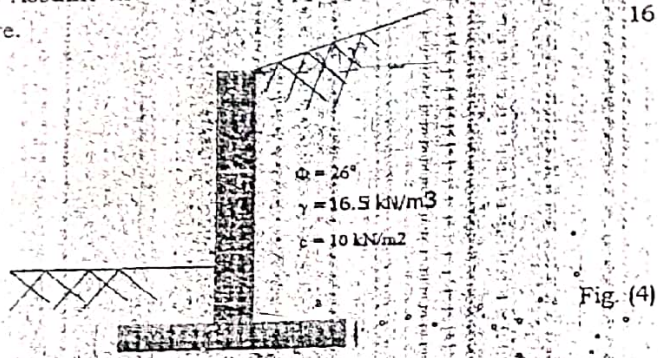

Fig. (4)

6(a) What are the types of Caissons? Describe and write the advantages and disadvantages of any two of them. 8

(b) Determine the depth of embedment of cantilever sheet-pile as shown in Fig. (5). 8

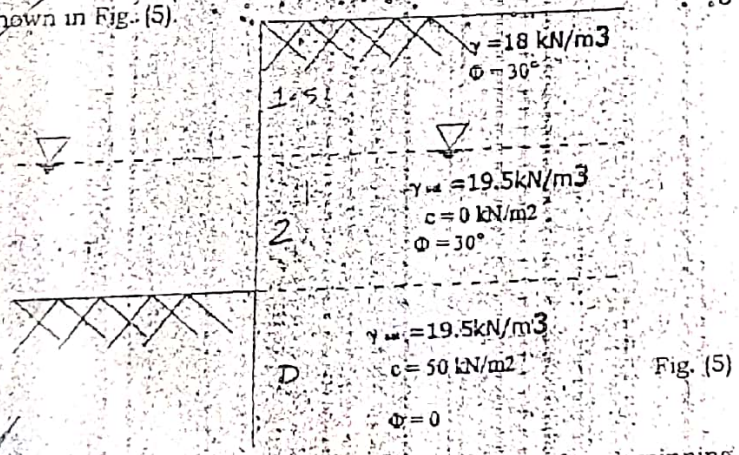

Fig. (5)

6(a) What is the underpinning? Define the purpose of underpinning and describe the method of underpinning. 8

(b) A concrete pile of 45cm diameter is driven to a depth of 16m through a layered system of sandy soil (c=0). The soil parameters are mention in the Fig. (6).

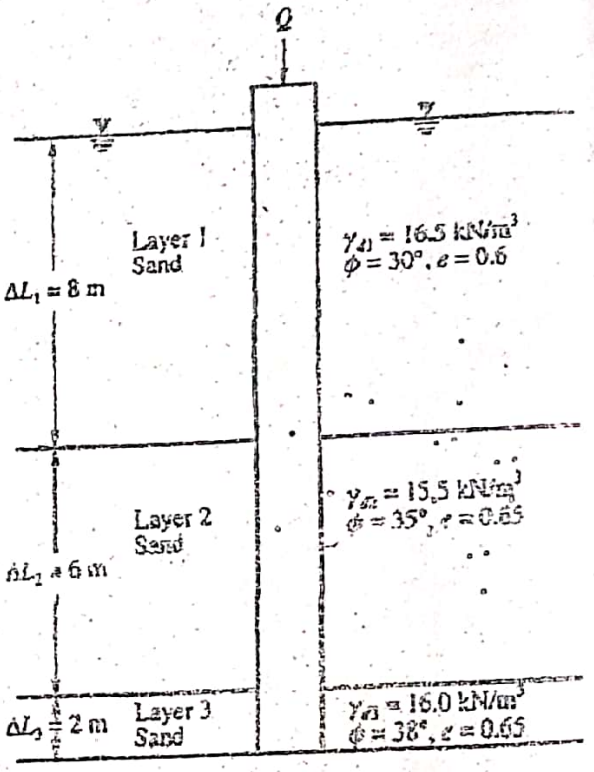

Fig. (6)

Assume that the value of δ all the layers of sand is equal to 0.75Φ. The value of K_s for each layer as equal to half of the passive earth pressure coefficient and N_q=95. The water table is at ground level. Calculate the ultimate load carrying capacity of pile and allowable load with F_s=2.5.