PURBANCHAL UNIVERSITY
2018

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

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

BEG375CO: Numerical Methods *(New Course)*

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

The figures in the margin indicate full marks.

Group A

Answer SIX questions.   6×10=60

1(a) Define error with an example. Find the truncation error if the number 752.6835 is truncated to four significant digits.   5

(b) Write the applications of Numerical Method in Civil Engineering. 5

2(a) Find a real root of the equation $x^2-2x-3=0$ using Newton Raphson method correct up to three decimal places.   5

(b) Show that Newton Raphson method is said to have quadratic convergence.   5

3. Solve the system: 10

$$8x+3y+4z = 5;$$
$$3x+10y+5z = 6;$$
$$4x+5y+ 16z = 7$$

using Gauss Jacobi iteration method.

4. Fit a curve $y=ae^{bx}$ to the following data: 10

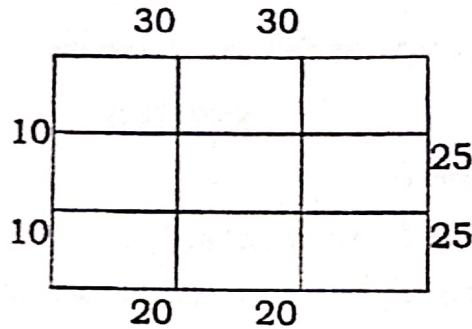| x	5.01	10.00	15.05	25.10
y	40.1	45.2	60.3	70.3

5. Using Simpson's $\frac{3}{8}$ rule, evaluate $\int_{0}^{1} \frac{dx}{1+x^2}$ 10

6. Solve the initial value problem $y'=2x+3y$, $y(0)=1$ at $x=0.2$ using Runge Kutta Fourth order method. Take $h=0.1$.   10

Contd. ...

7. Solve the Laplace equation $u_{xx}+u_{yy}=0$ in the region $0<x<1$, $0<y<1$, where $u(0, y)=10$, $u(x, 0)= 20$, $u(1, y)=25$, $u(x, 1)=30$, take $h = \dfrac{1}{3}$ as shown below in the figure. 10

Group B

Answer TWO questions. 2×10=20

8. Write a C-program of linear curve for determining the constants of linear equation. 10

9. Write a C-program of Lagrange interpolation for fitting a polynomial in a given set of data points. 10

10. Write an algorithm of Gauss Elimination method for solving linear system. 10

PURBANCHAL UNIVERSITY
2017

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

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

BEG375CO: Numerical Methods *(New Course)*

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

The figures in the margin indicate full marks.

Group A

Answer SIX questions.   6×10=60

1(a) What is error? Explain different types of error.   5

(b) Explain the importance and scope of Numerical Method for Civil Engineers.   5

2(a) Prove that the Newton Raphson method is quadratically convergent.   5

(b) Use Secant Method to find an appropriate root of the equation $f(x)=3x+\sin x+e^x$ correct up to 3 decimal places.   5

3(a) Use the method of least square to fit a straight line to the following data.   6

x	0	5	10	15	20
y	7	11	16	20	26

(b) Use Newton Forward Method to find the value of y at x=21 and x=28 from the following data: 4

x	20	23	26	29
y	0.3420	0.3907	0.4384	0.4848

Estimate value of y when x=25.

4(a) Use Simpson's 3/8 rule to evaluate $\int_0^6 \dfrac{dx}{1+x^2}$. Also find the error. Take n=6.   5

(b) Compute the integral $\int_{-2}^{2} e^{\frac{-x}{2}}\, dx$ using Gaussian two-point formula.   5

Contd. ...

5. Solve the following system of equations using Gauss-Jordan method correct up to 3 decimal places. 10

$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$

6. Apply Runge-Kutta fourth order method to find an approximate value of y when x=0.2 given by $\dfrac{dy}{dx} = x + y^2$ and y=1 when x=0, take h=0.1. ·10

7. Solve numerically the wave equation, 10

$$f_{tt}(x,t) = 4f_{xx}(x,t)$$

with the boundary conditions,

f(0,t)=0 and f(5,t)=0 and initial values

f(x,0)=f(x)=x(5-x)

f_t(x, 0)=g(x)=0

Group B

Answer TWO questions. 2×10=20

8. Write a program to solve a non linear equation using Bisection method. 10

9. Write an algorithm and program for Lagrange interpolation. 10

10. Write a program to solve differential equations using Euler's method. 10

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

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

BEG375CO: **Numerical Methods** *(New Course)*

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

The figures in the margin indicate full marks.

Group A

Answer SIX questions.   **6×10=60**

1. Explain the importance of Numerical method for an Engineer. Find the root of the nonlinear equation $xe^x - 1 = 0$ using Bisection method, correct up to 3 decimal places.   **2+8**

2. How can we improve the accuracy of a numerical integration process? Use Romberg integration to evaluate $\int_b^3 \left(\frac{1}{1+x^2}\right)dx$ **2+8**

3(a). Fit the power curve $y=ax^b$ from the data given below. Also find the value of y at x=5.   **5**

x	1	2	3	4
y	0.5	2	4.5	8

(b) From the given below; estimate the value $e^{2.5}$ using Lagrange's interpolation formula.   **5**

X	1	2	3
e^x-1	1.718	6.389	19.086

4. Solve the following system of equations by using Dolittle LU decomposition method: **10**

$$x + y - 2z = 3$$
$$4x + 2y + z = 5$$
$$3x - y + 3z = 8$$

5. Solve the following equations by Gauss-Seidel method: **10**

$$2x - 7y - 10z = -17$$
$$5x + y + 3z = 14$$
$$x + 10y + 9z = 7$$

6. Solve the Poisson equation $\nabla^2 f - 2xy = 0$ over the square domain $0 \le x \le 3$ and $0 \le y \le 3$ with $f = x + y$ on the boundary. Take h=1.   10

7. Apply Runge-Kutta fourth order method to find an approximate value of y when x=0.2 given that $\frac{dy}{dx} = x^2 + y$ and y=1 when x=0, take h=0.1.   y1=6.4364   10

Group B

Answer TWO questions.   2×10=20

8. Write an algorithm and program to find the root of non linear equation using regular falsi method.   10

9. Write a program in any high level language to find $\int_a^b (1 + x^3)\,dx$ using Simpsons 3/8 rule.   10

10. Write a program in any level language to solve the differential equation using Euler's Method.   10

PURBANCHAL UNIVERSITY
2015

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

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

BEG370CO: Numerical Methods (*New Course*)

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

The figures in the margin indicate full marks.

Group A

Answer SIX questions.   6×10=60

1(a) Prove that the Newton-Raphson method is quadratically convergent.   6

(b) Evaluate the following polynomial using Horner's rule: 4

$f(x) = x^4 + 4x^2 - 5$ at $x = 2$

2. Solve the following set of equations using Gauss Seidal method. 10

$3x_1 + 6x_2 + x_3 = 16$

$2x_1 + 4x_2 + 3x_3 = 13$

$x_1 + 3x_2 + 2x_3 = 9$

3. Fit a quadratic curve to the data in the table below: 10

x:	1.0	2.1	3.2	4.0
y:	2.0	2.5	3.0	4.0

4. Evaluate $\int_0^1 \dfrac{dx}{1+x^2}$ using Simpson's $\dfrac{1}{3}$ rule and hence evaluate the value of π. Take h=0.125.   10

5. Solve the differential equation for y(2) $\dfrac{dy}{dx} = x + y, y(0) = 1.$

Using fourth order R.K. method, taking h = 1.   10

6. Find the largest eigen value and corresponding eigen vector of the following matrix, using power method: 10

$$\begin{bmatrix} 2 & 2 & 2 \\ 2 & 5 & 5 \\ 2 & 5 & 1 \end{bmatrix}$$

Contd. ...

7. Estimate the value of f(1.35) using Newton's interpolation polynomial.

x:	1.2	1.3	1.4	1.5
f(x):	1.063	1.091	1.119	1.145

Also find the polynomial.

Group B

Answer TWO questions.   2×10=2

8. Write a program to find the root of non-linear equation usin Bisection method.

9. Write a program to fit the straight line for the given set of da points.

10. Write a program to evaluate the value of a function at specific point, using lagrange interpolation polynomial method.

PURBANCHAL UNIVERSITY
2014

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

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

BEG375CO: Numerical Methods (*New Course*)

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

The figures in the margin indicate full marks.

Group A

Answer SIX questions.   **6×10=60**

1(a) Discuss absolute, relative, percentage and truncation errors with examples.

 (b) Find the positive root of $x^4-x=10$ correct to three decimal places, using Newton-Raphson method.

2. Apply factorization method to solve the equations:

$3x + 2y + 7z = 12$
$2x + 3y + z = 6$
$3x + 4y + z = 7$

3(a) Use Lagrange method to find $f(1.5)$ from following:

x:	1	2	3
y:	1	1.414	1.732

 (b) Fit a curve of the form $y=ae^{bx}$ to the following data:

x:	0	1	2	3
y:	1.05	2.10	3.85	8.30

4. Find $f(42)$ from the following data using Newton's backward formula:

x:	20	25	30	35	40	45
f(x):	354	332	291	260	231	204

5. Solve the laplace equation $\nabla^2u=0$ over the interior nodes when the temperatures on the boundary are given as shown in figure below.
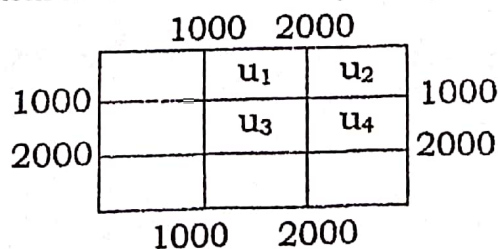
6. Given that:

x:	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y:	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find the first and 2nd derivative at $x = 1.1$

7. Solve the initial value problem $dy/dx = x - y^2$, $y(0) = 1$ to find $y(0.4)$ using Runge-Kutta method of order 2 taking step value h=0.2.

Group B

2×10=20

Answer TWO questions.

8. Write a program that solves system of linear equations by using Gauss elimination method.

9. Write a program that fits a straight line y=a+bx to a given set of data points by the method of least squares.

10. Write a program that integrates a given function using composite Trapezoidal rule.

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PURBANCHAL UNIVERSITY

2013

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

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

BEG370CO: Numerical Methods *(New Course)*

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

The figures in the margin indicate full marks.

Group A

Answer SIX questions.   6×10=60

1(a) What is error? Explain general formula to calculate different errors.

(b) Explain different characteristics of numerical computation.

2(a) Find the real root of the equation $x^3 - 4x - 9 = 0$ correct to 3 decimal places by using bisection method.

(b) Using Newton Raphson method, find the root correct to two decimal places, given the initial root as 0.5 of the equation $x^3 - 6x + 4 = 0$.

3(a) Using the principle of least squares, fit an equation of the form $y = ae^{bx}$ to the following data.

x	1	2	3	4
y	1.65	2.70	4.50	7.35

(b) The following data gives the melting point of an alloy of lead and zinc. where t is the temperature in degree °C and p is the percentage of lead in the alloy.

p	40	50	60	70	80	90
t	184	204	226	250	276	304

Using Newton's Interpolation formula, find the melting point of the alloy containing 84 percent of the lead.

Contd.

4(a) Divide the range into 10 equal parts, find the approximate

value of $\int_{0}^{\pi} \sin x\, dx$ by Simpson's rule. **(2)**

(b) Compute the integral

$\int_{-2}^{2} e^{\frac{-x}{2}}\, dx$ using Gaussian two-point formula.

5(a) Find the eigen values and eigen vectors of the following matrices.

$$\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$

(b) Solve the following system of equations using Gauss-Jordon method.

$x+2y+z = 3; \; 4x+4y-3z = 10; \; 3x-y+2z = 2$

6(a) Using Euler's method, solve numerically the equation, $y' = x + y$, $y(0) = 1$, for $x=1$.

(b) Find $y(0.1)$, $z(0.1)$ from the system of equations,

$\dfrac{dy}{dx} = x + z, \dfrac{dz}{dx} = x - y^2$ given $y(0)=2, \; z(0)=1$ using Heun's method.

7(a) Solve the Poisson equation

$\nabla^2 f = 2x^2 y^2$

Over the square domain $0 \le x \le 3$ and $0 \le y \le 3$ with f=0 on the boundary and h=1.

(b) Solve numerically the wave equation,

$f_t(x, t) = 2 f_{xx}(x, t) \; 0<t<1.5$ and $0<x<4$

with the boundary conditions

$f(0,t)=0$ and $f(4,t)=0 \quad 0 \le t \le 1.5$

and initial values.

$f(x,0) = 50(4-x) \qquad 0 \le x \le 4$

Group B

Answer TWO questions.

Write algorithm and program in any high level language the following problems.

8. To solve a non linear equation using secant Method.

9. To solve system of equation using Gauss Elimination.

10. To solve differential equations using Runga Kutta Method.

PURBANCHAL UNIVERSITY
2012

B.E. (Civil)/Fifth Semester/Final
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG375CO: Numerical Methods

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

The figures in the margin indicate full marks.

Group A (38) +10 = 48

Answer SIX questions.   6×10=60

1(a) Find the round off error in storing the number 456.5362 using five digit mantissa.   5

(b) Evaluate the polynomial $f(x) = x^3 - 3x + 6$ using Honer's rule at x=2.5.   5

2. Show that the order of convergence of secant method is 1.618.   10

3. Fit the power equation $y=ax^b$ to the data given below,   10 $1.051 x^{1.005}$

X	2	4	6	8
Y	1.4	2.0	2.4	2.6

4. Find the polynomial of degree three to fit the following points using Newton's interpolating polynomial:

x	1.2	1.3	1.4	1.5
f(x)	1.063	1.091	1.119	1.145

And calculate f(1.35).   10

5. Solve the following set of equations using Gauss Jordan method

$$x_1 + 2x_2 - 3x_3 = 4$$
$$2x_1 + 4x_2 - 6x_3 = 8$$
$$x_1 - 2x_2 + 5x_3 = 4$$

6. Evaluate:

$$\int_0^1 \int_0^1 e^{(x+y)} dx dy$$

Using trapezoidal and Simpson rule. Take h=0.125.   10

Contd. ...

PURBANCHAL UNIVERSITY
2013

B.E. (Civil)/Fifth Semester/Back
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG375CO: Numerical Methods (Old Course)

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

The figures in the margin indicate full marks.

Group A

Answer SIX questions.   6×10=60

1(a) What is the importance of Numerical Methods in Civil Engineering?   5

(b) Find a real root of the equation $x^3-2x-5=0$ using Bisection Method.   (132)   5

2. Prove that the Secant Method is superlinear convergent.   10

3. For the following table of values:

x:	1	2	3	4	5
f(x):	1	8	27	64	125

(i) Find P(2.5) using a Lagrange interpolation with a quadratic interpolating polynomial.

(ii) Repeat using a cubic interpolating polynomial.

(iii) Repeat with a fourth order polynomial.

Also Compare the values of P(2.5) obtained by the three methods and comment on your answer.   10

4. Use Romberg integration to evaluate R_{22} for $\int_0^{\pi/2} \frac{\cos x}{\sqrt{1+\sin x}} dx$.   10

5. Solve the differential equation $\frac{dy}{dx} + xy = 0$, y(0)=1 from x=0 to x=0.25 using fourth order Runge-Kutta Method.   10

Contd. ...

6. Solve the following system of equations using Gauss-Seidal Method: 10

$$10x_1 + 2x_2 + x_3 = 9$$
$$2x_1 + 20x_2 - 2x_3 = -44$$
$$-2x_1 + 3x_2 + 10x_3 = 22$$

7. Solve the Poisson equation:

$$\nabla^2 f = 2x^2 y^2$$

Over the square domain $0 \leq x \leq 3$ and $0 \leq y \leq 3$ with $f=0$ on the boundary and $h=1$. 10

Group B

Answer TWO questions. 2×10=20

8. Write a program in any high level language to find the solution of non-linear equation using Newton-Raphson Method. 10

9. Write a program in any high level language to find the solution of system of linear equations using Gauss-Seidal Method. 10

10. Write an algorithm for Lagrange Interpolation. 10

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7. Find the largest eigenvalue and the corresponding eigenv of the following matrix using the power method.

$$A = \begin{bmatrix} -1 & 0 & 0 \\ 1 & -2 & 3 \\ 0 & 2 & -3 \end{bmatrix}$$

Group B

Answer TWO questions.

8. Write a program in high level language to find the ro linear equation using false position method, with its and flowchart.

9. Draw a flowchart and write a high level program t polynomial using Lagrange interpolation method.

10. Write a high level program to solve the set of equa simple Gauss Elimination method.
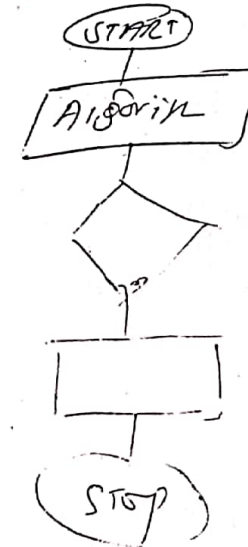
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PURBANCHAL UNIVERSITY
2018

B.E. (Civil)/Fifth Semester
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG351CI: Concrete Technology & Masonry 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: 456-2000 and IS: 1905-1987 are allowed to use. Assume suitable data appropriately if required.

Answer FIVE questions selecting at least TWO from each Group.

5×16=80

Group- A

1(a) Define the term Green concrete. Describe various types of cements.   1.5+3.5

(b) Define Abram's Law and its validity? Discuss various types of admixtures and their types.   3+2

(c) Calculate the gel/space ratio and theoretical strength of concrete sample made with 400 gm of cement with 0.4 w/c ratio on full hydration.   6

2(a) What is curing and what are various methods of curing. List various properties of hardened concrete.   5+2

(b) Differentiate between design mix and nominal mix.   3

(c) If cube compressive strengths are obtained as [20], [22], [29], [19], [27], [18] MPa, calculate mean strength and characteristics strength for 95% confidence level.   6

3(a) Define segregation and bleeding. . Determine the tensile strength of a concrete cylinder 150mm×300mm and cube 150mm×150mm in sizes and under standard splitting test if the load shown by the testing machine is 500kN.   2.5+2.5

(b) Explain oxide compound composition of cement and their roles in strengths. Also explain the role of Bogue's equation in this regards.   5

Adersha

(c) Write the procedure of IS method of design mix. 6

Group- B

4(a) What are the properties of wet Mortar? 4

(b) Design a reinforced brickwork lintel for the window opening of span 2m. The wall height above the lintel is 1.2m. The thickness of the wall is 200mm, use brick work with characteristics strength 15 MPa and steel grade Fe 415. 6

(c) Write down the methods of compressive strength test in bricks. 6

5(a) Work out for the minimum width of the wall from the following data for vertical earth face: 8

    Top width=0.4 m, height= 2.4m
    Average unit weight of earth retained and masonry wall=1600 kg/m^3 and 2200 kg/m^3
    Angle of friction= 30°
    Maximum Allowable Soil Pressure= 12000 kg/m^2
    Coefficient of friction= 0.7
    The top surface of backfill is level, assume no cohesion.

(b) Design an interior wall of one stories building carrying eccentric load due to unequal short span of 3m and 2.5m on either side of the wall. Use length of wall as 4m. The height of storey is 3m and load on roof is 10kN/m. 8

6(a) Describe the types of bonds use in masonry structure. 4

(b) Describe the seismic strengthening provision for stone building mostly used in rural Nepal. 4

(c) Design a compound wall the height of which is 2.5 m up to the top of copping. Assume the wind pressure on the wall is uniformly distributed of intensity 1000 N/m^2. Take the safe bearing pressure on the soil is 120 kN/m^2. 8

PURBANCHAL UNIVERSITY
2017

B.E. (Civil)/Fifth Semester

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

BEG351CI: Concrete Technology & Masonry 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: 456-2000 and IS: 1905-1987 are allowed to use. Assume suitable data appropriately if required.

Answer FIVE questions selecting TWO from each Group.   5×16=80

Group- A

1(a) What are the components obtained during hydration of cement. Also discuss their role in concrete strength and hardening.   4

(b) Define admixture. Explain the advantages of mineral admixtures.   4

(c) Find the Fineness Modulus (FM) from the following data: 4

Total weight = 500gm

IS Sieve Sizes	4.75mm	2.36mm	1.18mm	600 micron	300 micron	150 micron
Wt. Passing (gm)	490	440	390	295	120	35

(d) Write short notes on any TWO: 2+2

(i) Bulking Sand   (ii) Bleeding and segregation of concrete

(iii) Water Cement Ratio.

2(a) Explain the design steps of concrete mix design based on ACI method.   6

(b) Define curing and why is it done? Explain the various methods of curing.   4

(c) Calculate the modulus of rupture of the concrete beam under single and two points loading for following data: 6

(i) Size of beam=150mm×150mm
(ii) Length of beam = 750mm
(iii) Failure load for single point loading is 100KN
(iv) Failure load for two point loading each of 50KN.

                                        Contd. ...

3(a) What do you mean by Non Destructive Testing. Write its significance with their types.   2+3

(b) List out the various types of strengths and their tests. Explain shrinkage and creep phenomenon in concrete.   2+3

(c) Based on the assumption that 75% hydration completed in 28 days and 1 cm3 of cement produce 2.06 cm3 of hydrated product, Calculate gel space ratio, porosity and theoretical compressive strength.   6

Group- B

4(a) Describe various masonry units used in-Nepal.   4

(b) Make comparison of English bond with Flemish bond of masonry structure.   6

(c) How can we strengthen the masonry structures? Explain with examples.   6

5(a) Design an exterior wall of a workshop building 3.6m high carrying steel truss at the top at 4.5m spacing. The wall is securely tied at the roof and floor level. The following should be assumed: 8

(i) Concentrated reaction from the roof trusses=30KN acting at the center of the wall.

(ii) Roof loading = 7KN/m

Ignore wind load.

(b) Design a shear wall 5.0 m long and 4.0 m high to resist a horizontal seismic force in its plane. Assume the seismic load to be uniformly distributed across a height of the wall.   8

Earthquake acceleration = 0.1 g.

The wall is fixed at base and free at the top.

6(a) Explain the provisions for earthquake resistant design of stone masonry structures?   6

(b) Design a compound wall of height 2.0 m up to the top of 1000 N/m². The safe bearing pressure on the soil is 120 KN/m².   10

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B.E. (Civil)/Fifth Semester

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

BEG351CI: Concrete Technology & Masonry 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: 456-2000 and IS: 1905-1987 are allowed to use. Assume suitable data appropriately if required.

Answer FIVE questions selecting TWO from each Group.   5×16=80

Group- A

1(a) Explain the factors affecting the workability of fresh concrete. Why Flakey and Elongated aggregates are restricted to use in the good quality concrete?   5+3

(b) Explain the basic properties of cement compounds. What are the effects of admixtures in concrete?   4+4

2(a) Design concrete mix for RCC structures by IS method from following data: 10

Grade of concrete: M20	Specific gravity of coarse aggregate = 2.5
Exposure condition: Moderate	Specific gravity of fine aggregate = 2.7
Maximum size of aggregate: 20mm	Specific gravity of cement = 3.15
Type of coarse aggregate: Angular	Sand: Zone I
Workability (CF):0.9	% Air content for the M.S.A. is 2%
Grade of Cement: E	

Note: Graph should be provided.

(b) What are the methods of curing? Also explain its importance.   3+3

3(a) Explain the shrinkage and creep of concrete.   8

(b) Calculate the gel/space ratio and the theoretical strength of a sample of concrete made with 500gm of cement with 0.5 water/cement ratios, on full hydration and 60% hydration.   8

Group- B

4(a) Describe the various types of masonry units used in masonry structures.   8

(b) Describe the test performed for the compressive strength of cement mortar. Also, describe the efflorescence test and water absorption test for bricks.   4+4

5(a) Design an exterior wall of a workshop building 3.75m high carrying steel truss at the top at 4.25m spacing. The wall is securely tied at the roof and floor levels. Concentrated reaction from the roof trusses is 55KN at the Center of the wall. The loading on the roof is 8.5KN/m.   8

(b) Design an exterior wall of a single storey warehouse of 3.5m height. The loading on the wall consists of vertical load of 35.5KN/m from the roof and wind pressure of 950KN/m². The wall is tied with metal anchor at the floor and roof levels.   8

6(a) What are the roles of infill walls in reinforced concrete frames?   6

(b) Explain the load distribution on reinforced brick lintels in wall with clear drawings. Also, explain the design procedure of an axially loaded wall relating code provisions in IS-1905:1987.   5+5

PURBANCHAL UNIVERSITY
2015
B.E. (Civil)/Fifth Semester/*Final*

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

BEG351CI: Concrete Technology & Masonry 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: 456-2000 and IS: 1905-1987 are allowed to use. Assume suitable data appropriately if required.

Answer FIVE questions selecting TWO from each Group.   5×16=80

Group- A

1(a) Explain hydration of cement. Oxide composition of two cement types are given below. Comment which cement is suitable for high early strength requirement.   3+5

Oxides	CaO	SiO_2	Al_2O_3	Fe_2O_3	SO_3	Other
Cement 1	65%	21%	5.5%	4.5%	0.1%	3.0%
Cement 2	63%	22%	7.7%	3.3%	0.1%	3.0%

(b) What do you mean by bulking of sand? Explain various types of Chemical admixture.   3+5

2(a) Define nominal mix. Write the steps of concrete mix design by ACI method.   2+6

(b) Explain importance of curing. If cube compressive strength are obtained as: (20), (23), (29), (18), (27), (19) Mpa. Calculate mean strength and characteristic strength for 95% confidence level. 3+5

3(a) Explain 3-phase system of concrete. Explain various type of tensile strength of concrete.   3+5

(b) Explain creep phenomenon in concrete. List and explain various modulus of elasticity of Conte.   4+4

Group- B

4(a) List various grade of mortar classification as per Indian standard classification 1987. List and Explain in short about various types of wall.   3+5

(b) List and explain various tests performed on brick.

5(a) Design cavity wall of two story building with height 3.5m each consist RCC slab with total UDL from roof is 20KN/m and from floor is 30KN/m.

(b) Design interior solid wall of single storey building carrying eccentric load due to unequal span of 4.0m & 3.5m on either side. Storey height is 3m and intensity of loading from RCC roof is 5.5KN/m².

6(a) Determine moment of resistance of brick lintel with total width=230mm and 115mm total depth, if 4 nos–8mm mild steel bar (Yield strength=250N/mm²) is used with effective cover 30mm. Take characteristic strength of masonry 10N/mm².

(b) Explain various techniques of strengthening of different masonry building type.

B.E. (Civil)/Fifth Semester

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

BEG351CI: Concrete Tech. & Masonry 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: 456-2000 and IS: 1905-1987 are allowed to use. Assume suitable data appropriately if required.

Answer FIVE questions selecting TWO from each Group.   5×16=80

Group- A

1(a) List out the classifications of aggregates according to various aspects. What are the properties of fresh concrete? Explain.   2+6

(b) (i) Differentiate between the Cement Oxide and Cement Compounds and explain the mechanisms of hydration of cement.   2+2

(ii) What do you mean by Admixture? Explain the water reducing admixture and air entraining admixtures.   4

2(a) How does the Cube test results represent the quality control in site? Define Curing and explain the various methods of curing.   2+6

(b) List out the various types of strengths and their tests. Also, describe modulus of rupture (flexural tension) tests.   2+6

3(a) Explain the shrinkage and creep property of concrete.   8

(b) Design concrete mix for RCC structures by IS method from following data:

Grade of concrete= M30,   workability (CF)=0.8,

Exposure condition= severe,   grade of cement= 43MPa,

Maximum size of aggregate= 20mm,   sand= zone-I,

Type of coarse aggregate= angular,   sp.gr. of cement= 3.15,

Sp.gr. of coarse aggregate= 2.5,

Sp.gr. of fine aggregate = 2.7 and quality control is good.
% of Air content for the M.S.A is 2%.

Note: necessary charts and tables are given below: 8

Q. 3.b.

28-Day strength of cement, Tested
according to IS:4031-1968

A — 31.9-36.8 N/mm²
B — 36.8-41.7 N/mm²
C — 41.7-46.6 N/mm²
D — 46.6-51.5 N/mm²
E — 51.5-56.4 N/mm²
F — 56.4-61.3 N/mm²
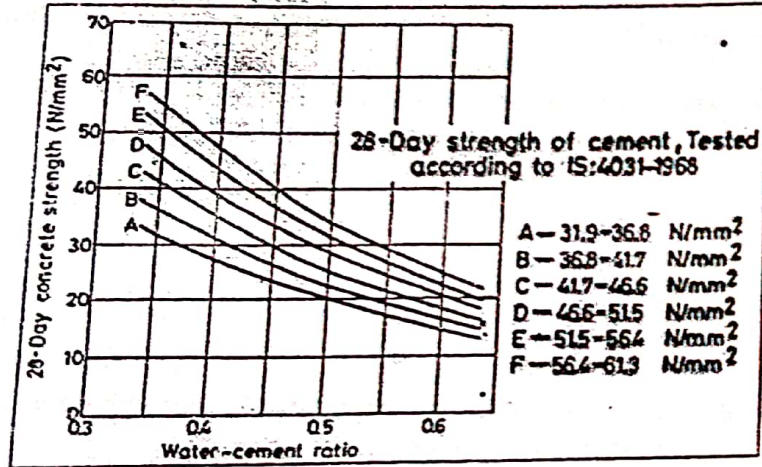
Adjustment table for water content & % sand in total aggregate.

Change in Conditions Stipulated for Tables	Adjustment Required in Water Content	% Sand in Total Aggregate
For sand conforming to grading Zone I, Zone III or Zone IV of Table 4, IS: 383-1979	0	+ 1.5% for Zone I − 1.5 % for Zone III − 3% for Zone IV
Increase or decrease in the value of compacting factor by 0.1	± 3%	0
Each 0.05 increase or decrease in water-cement ratio	0	± 1%
For rounded aggregate	− 15 kg	− 7%

Minimum Cement Content & Max. W/C for Durability (IS456:2000)

Exposure	PCC		RCC		Minimum Grade of concrete
	Min. Cement Kg/m3	Max. free W/C	Min. Cement Kg/m3	Max. free W/C	PCC
Mild	220	0.6	300	0.55	-
Moderate	240	0.6	300	0.5	M15
Severe	250	0.5	320	0.45	M20
Very severe	260	0.4	340	0.45	M20
Extreme	280	0.4	360	0.4	M25

Make the adjustment depending upon Ingredient properties.

Approximate Sand & Water content (Kg/m3) for Compaction Factor
(approximate slump 30mm), Angular coarse aggregate & Sand zone II as per IS.

Maximum Size of Aggregate (mm)	Water Content including Surface Water. Per Cubic Metre of Concrete (kg)	Sand as per cent of Total Aggregate by Absolute volume
10	200	40
20	186	35
40	165	30

Maximum Size of Aggregate	Water Content including Surface Water Per Cubic Metre of Concrete (kg)	Sand as per cent of Total Aggregate by Absolute Volume
10	200	28
20	180	25

Group- B

4(a) Write the advantages of concrete blocks. Briefly explain properties of wet mortar. And describe the flexural strength of brick.

(b) What are the basic physical tests of bricks? Describe the bonds used in masonry structures.

5(a) Design an interior wall of a two storeyed wall carrying slabs with a storey height of 3.15m. The wall is stiffened 230mm thick intersecting walls at 4.0m c/c. Also, the wall door opening of size 1.2mx2.1 m at a distance of 0.6m from end of the intersecting walls. Roof loading=17.5KN/m loading = 13.25KN/m. Assume other loading if necessary

PURBANCHAL UNIVERSITY
2014

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

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

BEG351CI: Concrete Tech. & Masonry 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: 456-2000 and IS: 1905-1987 are allowed to use. Assume suitable data appropriately if required.

Answer FIVE questions selecting TWO from each Group.　5×16=80

Group- A

1(a)　Briefly explain hydration of cement. Oxide composition of two cement types are given below. Comment which cement is suitable for high early strength requirement.　　　　　3+5

Oxides	CaO	SiO_2	Al_2O_3	Fe_2O_3	SO_3	Other
Cement 1	65%	21%	5.5%	4.5%	0.1%	3.0%
Cement 2	63%	22%	7.7%	3.3%	0.1%	3.0%

Set of Bogue's equations follows as:

$\%C_3S = 4.071C - 7.60OS - 6.718A - 1.43OF - 2.850 \bar{S}$

$\%C_2S = 2.867 S - 0.754 C_3S$

$\%C_3A = 2.650 A - 1.692 F$

$\%C_4AF = 3.043 F$

(b)　Elucidate bulking of sandy. Classify aggregate according to their shape.　　　　　4+4

2(a)　Explain 3-phase system of concrete. Explain various type of tensile strength of concrete.　　　　　4+4

(b)　Explain various temperature effects on concrete. If cement hydrates 50% on 7days and W/C =0.5, determine (i) 7days strength and (ii) strength for complete hydration.　4+4

3(a)　Define bleeding & segregation. Explain various types of Chemical admixture.　　　　　2+6

Contd. ...

(b) What do you understand by nominal mix? Write the steps of concrete mix design by DOE method.   2+6

Group- B

4(a) What do you understand by bonds in bricks? List & Explain in short about various types of wall.   3+5

(b) List & explain various tests performed on brick.   8

5(a) Design cavity wall of two storey building with height 3m each consist RCC slab with total UDL from roof is 20KN/m & from floor is 30KN/m.   8

(b) Design interior solid wall of single storey building carrying eccentric load due to unequal span of 4.5m & 3.5m on either side. Storey height is 3m & intensity of loading from RCC roof is 5KN/m².   8

6(a) Determine moment of resistance of brick lintel with total width = 250mm & 150mm total depth, if 2nos - 10mm. mild steel bar (Yield strength = 250N/mm²) is used with effective cover 30mm. Take characteristic strength of masonry 15N/mm².   8

(b) Explain various techniques of strengthening masonry building types.   8

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PURBANCHAL UNIVERSITY
2013

B.E. (Civil)/Fifth Semester/*Final*
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG351CI: Concrete Tech. & Masonry 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 2000, IS 1905, NBC 109 and relevant masonry code is allowed.

Answer FIVE questions selecting TWO from each Group.

Group- A

1(a) what is good concrete? Illustrate is there any relationship between the cementing properties and heat of hydration of cement?   2+3

(b) Define Abram's Law and its validity? What is role of retarder in concrete? Under what Circumstances they are usually used? 2+3

(c) Find the Bogue's composition of cement with oxide composition given below:

Oxide	Content Percentage		
	Udayapur	JP	Sona
Cao	68.2	61.0	64.2
SiO_2	22.4	25.0	20.7
Al_2O_3	4.6	4.0	3.9
Fe_2O_3	0.3	3.0	5.3
SO_3	2.4	2.5	2.0
Free Lime	3.3	1.0	1.5

Which one is better in hot climate and why?   6

2(a) Is there any relationship between Standard deviation and Characteristics strength? Write down the design step of design mix by ACI Method.   1+5

(b) Differentiate between Nominal mix and Design mix in concrete? 5

(c) At a construction site, cube test was conducted for test of compressive strength of concrete. The strength of 8 cubes were noted as 20, 23, 24, 26, 28, 26, 28 and 30 Mpa and they were normally distributed. Determine the characteristic strength of concrete with 95% confidence level.   5

3(a) Calculate Gel/Space ratio and theoretical strength of concrete sample made with 400 gm of cement with 0.4 W/C ratio on full hydration and 80% hydration.   5

(b) Elucidate the stress strain relationship of concrete and uses of modulus of elasticity.   4+2

(c) Write short notes on any TWO: 2.5+2.5
   (ii) Properties of hardened Concrete
   (ii) Segregation and Bleeding
   (iii) Strength Porosity relationship

Group- B

4(a) Describe types of bonds use in masonry construction?   4

(b) Design an interior Wall of a double storey building of height 5.0 m supporting a RCC slab and Roof. The wall is stiffened by piers of c/c Spacing is 3.0m, Width of pier is 200mm and Thickness of pier is 400mm. The bottom of the wall rest over a foundation block. Assume Floor load= 5kN/m and Roof load= 4kN/m.   8

(c) Describe various properties of wet mortar?   4

5(a) Design an interior Cavity wall of three storey building, the ceiling height of each storey is 3.0m. The wall is stiffened by intersecting walls 200mm thick at 3600mm c/c. Take, Strength of brick=15 Mpa, Mortar type=M_1, Roof load=15kN/m and Floor load=12kN/m.   6

(b) Describe the seismic strengthening provision for stone building
_____ ____ ____ _____   4

(c) Design a reinforced brickwork lintel for the window openi span 2m. The wall height above the lintel is 1.2m. The thic of the wall is 200mm, use brick work with character strength 15 Mpa and steel grade of 415 MPa.

6(a) A masonry retaining wall has overall height of 2.4m, Wi top=0.4m. If the earth face is vertical. Determine minimum of the wall for the following data:
   Unit Weight of Earth Retained= 1600kg/m^3
   Unit Weight of masonry= 2200kg/m^3
   Angle of Friction= 30°
   Coefficient of Friction= 0.7
   Maximum allowable soil pressure= 12000kg/m^3
   The top surface of the backfill is level, assume no c between partial of backfill.

(b) Design a compound wall the height of which is 2.5m u top of copping assume the wind pressure on the wall is u distributed of intensity 1000N/m^2. Take the safe pressure on the soil is 120 kN/m^2.

PURBANCHAL UNIVERSITY
2018

B.E. (Civil)/Fifth Semester/*Final*
Time: 03:00 hrs.
Full Marks: 80 /Pass Marks: 32
BEG355CI: Water Supply 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 wherever necessary.

Answer FIVE questions.   5×16=80

1(a) What do you understand by potable and wholesome water? What are the objectives of water supply system?   2+4

(b) The city has an average water demand of 6202 million liters per month. Calculate the capacity of impounded reservoir. The flow is the river is shown below: 10

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Inflow (m³/s)	2.97	1.99	1.00	0.00	0.51	1.00	2.00	3.00	4.00	5.00	4.00	2.8

2(a) What are the important considerations that govern the site selection of an intake? Describe river intake with a help of neat sketch.   3+3

(b) What is design year and design period? The census data of a town are as follows: Predict the population for year 2025 by incremental increase method.   2+8

Year	1950	1960	1970	1980	1990	2000	2010
Population	25000	27500	34100	41500	57500	54500	59910

3(a) What are the actions take place when water is filtered through the bed of filter media? Explain slow sand filter and rapid sand filter.   8

(b) Compute the dimensions of a continuous flow sedimentation tank for a population of 30000 persons with a daily per capita demand (average) of 100 liters. Assume detention period to be 6 hours.   8

Contd. ...

4(a) Explain the process of sedimentation with coagulation. What are the chemicals used as coagulants? Why are they necessary?   8

(b) Design the size of distribution pipe AB and BC with following data and population are as shown in figure below: 8
- Average requirement of town is 150 lpcd.
- RL of pipe joint on the road are: at A-170 m, at B-155 m and at C-150m.
- Hazen William's coefficient, C =100
- RL of bottom of the O.H tank is 183.5m.
- Length of pipe AB = 700m and BC = 500m.
- The distribution system should be designed for a maximum demand of 2.7 times the average demand.
- The minimum head to be maintained at any point in the distribution system is 10m.
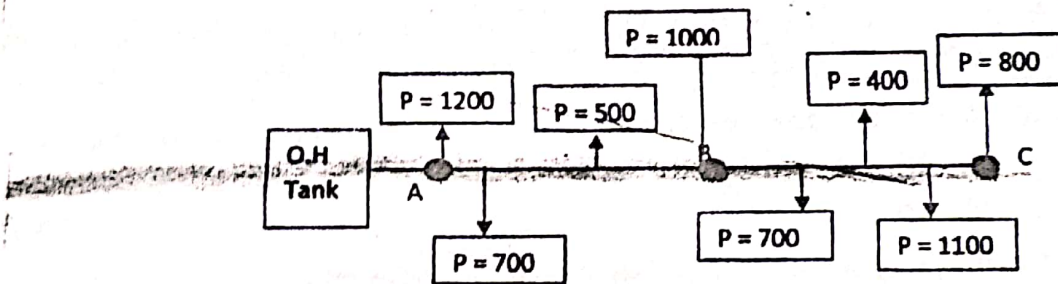
5(a) Describe in detail the process of pipe laying in water supply schemes.   7

(b) The total hardness value obtained from the complete analysis of a water sample is found to be 117 mg/I. The analysis further showed that the concentrations of all the three principal cations causing hardness are numerically same. If the value of carbonate hardness is 57mg/I, calculate the followings: 9
(i) the value of non-carbonate hardness
(ii) the concentration of principal cations and
(iii) the value of total alkalinity in mg/I

6. Write Short notes on: 4×4=16
(a) Air relief and reflux valve
(b) Collar joints
(c) Maintenance of water supply system
(d) Forms of chlorination

PURBANCHAL UNIVERSITY
2017

B.E. (Civil)/Fifth Semester/*Final*
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG355CI: Water Supply 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 wherever necessary.

Answer FIVE questions.   5×16=80

1(a) Define potable and wholesome water. What are the components of rural water supply scheme? Explain with a neat sketch.   2+6

(b) The census population of a community is given below:

Year	1960	1970	1980	1990	2000
Population	42000	50500	72300	91500	110000

Estimate the population of town in the year 2016 by arithmetic increase method and geometrical increase method.   8

2(a) Differentiate between surface water sources and underground water sources. List out the surface water sources with their suitability, water quantity and quality for drinking water supply   8

(b) The analysis of water showed the following results in mg/l.   8

Na^{++}=30.2 Mg^{++}=28.4 Ca^{++}=75 Ka^{++}=32.9

CI^{--}=32.3 HCO_3^-=120 SO_4^{--}=52.8 NO_3^-=12

The concentration of Strontium(Sr) is equivalent to a hardness of 12.5mg/l and the carbonate alkalinity in the water is zero. Calculate carbonate hardness, non-carbonate hardness and total hardness.   8

3(a) What is intake works. Explain the factors to be considered while selecting the site for intake works? Explain a river intake with a neat sketch.   8

(b) Design Rapid sand filter for a community having the population of 12500 and an average water demand of 100 lpcd. Assume necessary data suitably. 8

4(a) Compute the dimensions of a continuous flow sedimentation tank for population of 25000 with daily per capita demand of 100 liters. Assume detention period to be 6 hours. 8

(b) What are the common impurities present in water? What do you understand by hardness of water? Why is the softening of water necessary? 8

5(a) Explain break point chlorination. What are the factor affecting bacterial efficiency of chlorine? 6

(b) A part of water distribution system is shown in figure below. The average water requirement is 150 lpcd and water is distributed only from the point C for the population of 25000. The service reservoir is located at A. Design pipes AB and BC. The minimum pressure to be maintained is 15m and Darcy's coefficient of friction of f is 0.04. Assume peak factor of 3. Calculate velocity of water in pipes AB and BC. 10
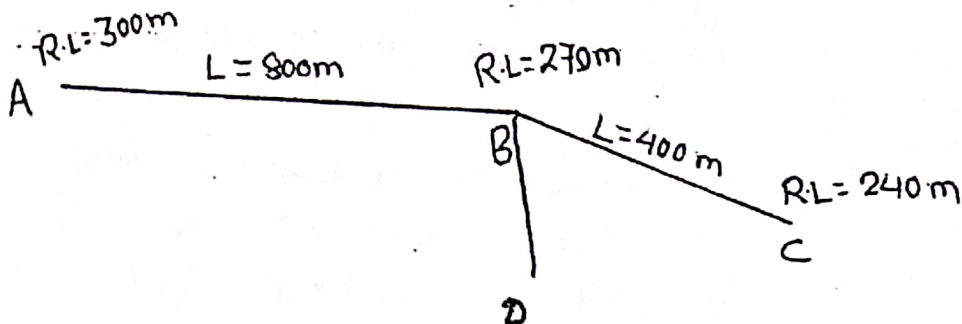
6. Write Short notes on any FOUR: 4×4=16
   (a) Infiltration Galleries
   (b) Different types of valves
   (c) Types of pipes
   (d) Expansion joints
   (e) Public stand post

$$P_n = P_0 + nI$$

PURBANCHAL UNIVERSITY
2016

B.E. (Civil)/Fifth Semester/*Final*
Time: 03:00 hrs.
Full Marks: 80 /Pass Marks: 32
BEG355CI: **Water Supply 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 wherever necessary.

Answer FIVE questions.   **5×16=80**

1(a) Draw schematic flow diagram of a rural gravity water supply scheme with the name of components. Differentiate between potable water and wholesome water.   6+2

(b) The flow in the river during the various months of the year (in m3/s) is as follows: 8

January- 1.5, February- 1.0, March- 1.0, April- 0, May- 0, June- 3.0, July- 4.0, August- 5, September- 6, October- 5, November-3, December- 1. The river supplies water to a community having a seasonal demand 5000 million litres/month for three month (July, Aug, Sep,) and 5700 million liter/month for another three months (Oct, Nov, Dec) and 6000 million litre/month for six months of dry season (Jan, Feb, Mar, April, May and June). Determine analytically the storage capacity of impounded reservoir.

                                                       8

2(a) A city has following census data:

Year (AD)	1970	1980	1990
Population (Nos.)	40000	45000	55000

Estimate the saturation population and expected population in the design year 2020AD.

(b) Enlist the factors which should be considered while selecting the for intake works of water supply. What is water based disease and its preventive measures.   4+2+2

                                             Contd. ...

3(a) What is the function of a Filter? Describe the different types of filter. Differentiate between the slow sand filter and rapid sand filter. Which type of filter you would choose for small village which has very low population growth rate?   1+3+3+1

(b) Design a rectangular sedimentation tank to treat 1.8 million liters of raw water per day. The detention period is required for 4 hours and overflow rate should be less than 50,000 liter/m² of surface area per day.   8

4(a) What are the purpose of operation and maintenance of water supply system. Explain the four types of valves mostly used in water supply system.   8

(b) Design slow sand filters for a population of 10000. Assume necessary data suitably.   10

5(a) Describe briefly with sketches the various layouts of water supply distribution system with their relative advantages and disadvantages. If a town is planned with rectangular layout of a road grid, which of the layout system do you prefer?   2+4

(b) Design pipeline AB and BC in the pipe network as shown in the figure   7+1
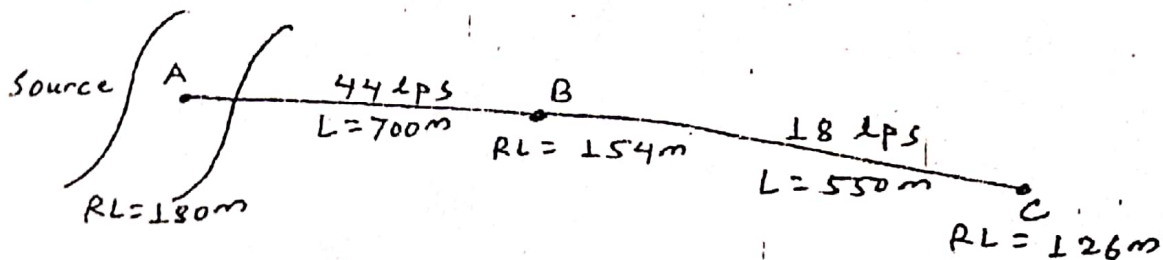
Minimum pressure in pipe line should be 1.5Kg./cm². Take Hazen William's coefficient as 100.

6.   Write Short notes on any FOUR: 4×4=16
    (a) Hardness of Water
    (b) Laying of pipes
    (c) Methods of Aeration
    (d) Break Pressure Tank
    (e) Expansion Joint and Flanged Joint

PURBANCHAL UNIVERSITY
2015

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

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG355CI: Water Supply 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 wherever necessary.

Answer FIVE questions. 5×16=80

1(a) As an water supply Engineer which type of layout, distribution system and system of supply is more convenient and practical in case of hilly area of Nepal? Explain with justification. 6

(b) Calculate the total water demand in the design year 2088 B.S for a village in Rukum, district of Nepal. The Data collected during survey are as follows:

Survey year = 2072 B.S
Population in survey year = 2320
Annual population growth = 1.5%
Annual population growth of student = 1%
Number of Cows = 4330
Number of Goats = 150
Number of Chickens =6720
Number of students = 200 boarders; 1020 day scholar 10

2(a) Define indicator organism and MPN. At dairy (DDC) of Lalitpur it was found that 2000 number of coli-form in 100ml of milk; what does it indicate? Is this milk recommended for the domestic purpose or not? 6

(b) The analysis of water sample of tube-well shows following result in ppm.

Ca^{++}=320 K^+=430 Mg^{++}=60 $NH_4^- = 70$

$HCO_3^- = 600$ $Na^+ = 2051$

Contd. ...

Calculate total hardness, carbonate hardness and non-carbonate hardness. Can this water be recommended for drinking purpose or not? Comment on it.

3(a) With neat sketch discuss about spring intake.

(b) A settling tank is designed for an overflow rate of 5000 litres per m² per hour. What percentage of particles of diameter: (i) 0.06mm, (ii) 0.03mm will be removed in this tank? Temperature of water is 20°C and specific gravity of particles is 2.65.

4(a) Define Break point chlorination? Explain significance of residual chlorination.

(b) Design Rapid sand filter having population of 12,000 for a urban area with water supply rate 135 lpcd.

5(a) Explain design steps of distribution system (Dead end system).

(b) A scheme layout of a rural water supply system of Ilam district Nepal is shown in figure. Design pipeline AB and BC. The average water supply rate is 200 lpcd and length of pipe AB and BC 525m and 752m respectively. Minimum pressures of 1.5kg/cc of water are required at taps. Assume C= 100 with peak factor 3, check velocity also.
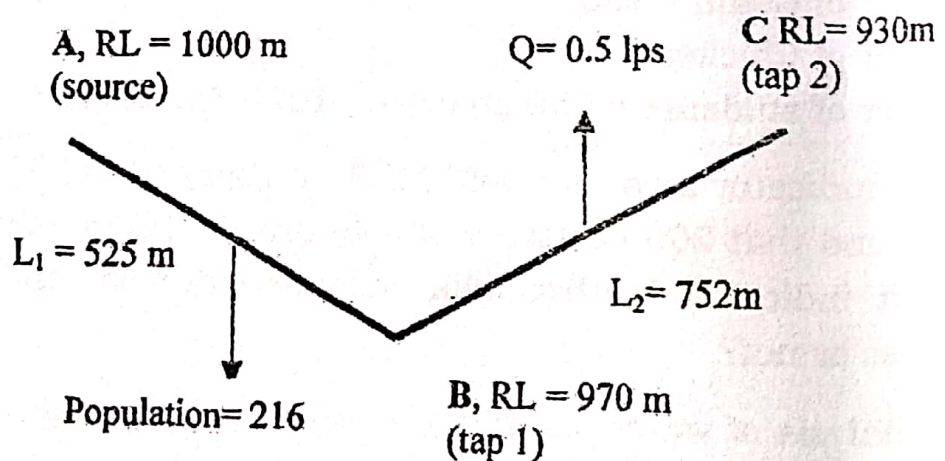
A, RL = 1000 m (source)   Q= 0.5 lps   C RL= 930m (tap 2)

L₁ = 525 m   L₂= 752m

Population= 216   B, RL = 970 m (tap 1)

6. Write short notes on any FOUR: 4x4
(a) Spigot joints
(b) Cast iron (CI) pipe
(c) Method of aeration
(d) public stand post
(e) Reflux value

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

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

BEG355CI: Water Supply 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 wherever necessary.

Answer FIVE questions.   **5×16=80**

1(a) Write a note on necessity and impact of a water supply scheme. Draw a typical component of urban water supply scheme.   3+3

(b) Following data shows the variation of the population of a Town from 1960 to 2010. Estimate the population of the city in the year 2030 from arithmetic, geometric and Incremental Increase Method. Population Statistics is as follows: 10

Year (AD):	1960	1970	1980	1990	2000	2010
Population (No):	70,000	82,000	1,05,000	1,30,000	1,70,000	2,10,000

2(a) Explain various types of surface source of Water. What is Infiltration Galleries?   8

(b) Determine the total, Carbonate and Bicarbonate hardness, if the following water quality parameters are known: 8
$Ca^{++}=150 \ g/m^3$, $Mg^{++}=40 \ g/m^3$, $NH_4^{++}=5 \ g/m^3$, $HCO_3=250 \ g/m^3$
(Atomic weight of Ca=40, Mg=24, H=1, C=12, O=16, N=14)

3(a) Explain the factors to be considered while selecting the site for Intake Works. Explain a River Intake with a neat Sketch.   8

(b) Compute the dimensions of a Continuous flow rectangular Settling Tank for a Population of 30 thousand people with a daily per Capita water allowance of 130 litres. Assume the detention period as 6 hours.   8

4(a) Write down the different forms of chlorination. Explain break point chlorination. What are the factors affecting the bacterial efficiency of chlorine?   8

Contd. ...

(b) Determine the dimension of a set of rapid sand filters for treating water at a small town required for population of 140,000 with an average rate of demand is 150 lpcd. Assume necessary data suitably.

8

5(a) Discuss with the help of neat diagrams, various layouts of distribution system.

8

(b) Design the main lines AB and BC for the population to be served in the network shown below. The length of AB and BC is 630m and 460m respectively and average water demand is 130 lpcd. The R.L of bottom of tank is 193m and the R.L of A, B and C along the road are 177m, 164m and 153m respectively. The peak factor is 3. The minimum pressure requirement is 1.7 kg/cm². Check Velocity in the pipes also.

8
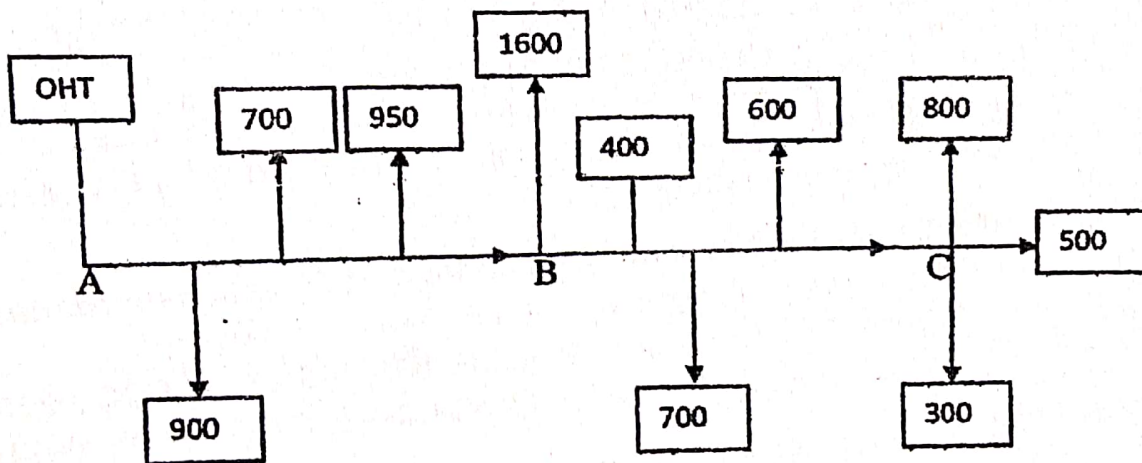
6.   . Write Short notes on any FOUR:

4×4=16

    (a) Design Period
    (b) Impurities in Water
    (c) Different types of Valve
    (d) Types of Pipes
    (e) Methods of Aeration

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

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

BEG355CI: Water Supply 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 wherever necessary.

Answer FIVE questions.

1(a) Define potable and wholesome water. Draw a typical flow diagram of rural water supply scheme. 2+4

(b) List different types of sources of water. Discuss their merits and demerits from quality, quantity and sustainability point of view. 3+7

2(a) Forecast the population in the year 2070, 2080 and 2090 using Geometrical Increase Method and Incremental Increase Method. 10

Year (B.S.):	2020	2030	2040	2050	2060
Population:	26000	30000	36000	44000	50000

(b) What are intakes? What are the important considerations which govern the site selection of an intake? 2+4

3(a) What are indicator organisms? Describe various water related diseases. 3+5

(b) Find the dimensions of a rectangular sedimentation tank which is required to treat 4 million litres of water per day. 8

4(a) Explain break point chlorination. What are the factors affecting bacterial efficiency of chlorine. 5+3

(b) Design rapid sand filters for a town with a population of 20000. The average rate of water demand is 135 lpcd. 8

5(a) Compare continuous and intermittent systems of water supply. 6

(b) Design pipes AB, BC and BD for the given branch network. Assume C=100 and minimum head to be maintained at each node is 10 mts.

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

(a) Factors affecting water demand
(b) Laying of Pipes
(c) Public Stand Post
(d) Impacts of Water Supply Schemes
(e) Sluice Valve
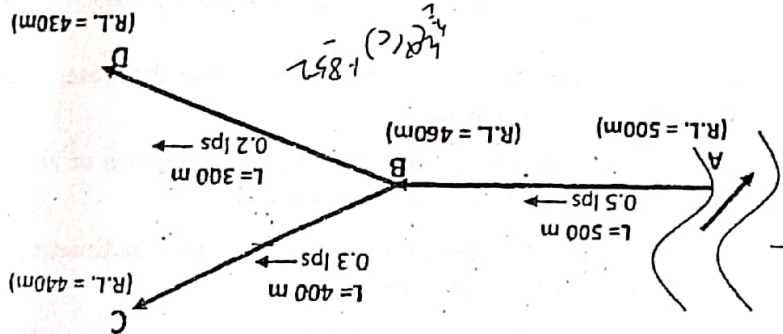
(2)

6 AM to 9 AM- 40% of total
9 AM to 12 Noon- 10% of total
12 Noon to 3 PM- 10% of total
3 PM to 6 PM- 15% of total
6 PM to 9 PM- 25% of total

Determine the capacity of the series reservoir assuming pumping to be at uniform rate and the period of pumping to be from 6 AM to 6:00 PM. Neglect fire demand and breakdown reserve.

8

5(a) Explain different types of pipe joint with neat sketches. 8

$L_1 = 510m$
$D_1 = 20cm$
$L_2 = 300m$
$D_2 = 40cm$
$L_3 = 400m$
$D_3 = 15cm$
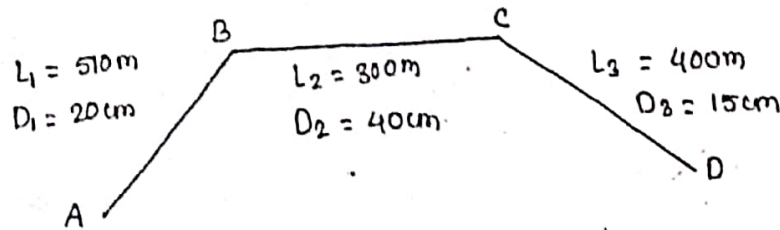
Fig. 5(b)

(b) Find the equivalent length of 30cm diameter pipe for the network shown in Fig. 5(b), using (i) Darcy's formula and (ii) Hazen William's formula. 8

6. Write short notes on any FOUR: 4×4=16
   (a) Maintenance of the Water Supply System
   (b) Method of Aeration
   (c) Rapid Sand Filters
   (d) Impurities in Water
   (e) Various Forms of springs
   (f) Variation in Water Demands

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 necessary data suitably.

Answer FIVE questions.

1(a) Define Potable, Contaminated and Wholesome water. On what factors the selection of the sources of the water depends upon. Discuss. 3+

(b) The population statistics of a town is given below. Estimate the population in 2030 by the arithmetical and geometrical increase method.

Year:	1960	1970	1980	1990	2000	2010
Population:	1,00,000	1,20,000	1,35,000	1,50,000	1,75,000	1,95,000

2(a) List out the various test carried to examine the water. Discuss the water related diseases.

(b) Write on the factors governing the site selection of intake work. Also draw neat sketches of river intake.

3(a) Explain the operations involved in sedimentation w coagulation with neat sketches.

(b) 4 million liters of water passes through a sedimentation tank day. The tank is 6m wide, 18m long and 3m deep. Calculate Dentention time, (ii) average velocity of flow and (iii) sur overflow rate.

4(a) What do you mean by Chlorine demand and chlorine Discuss on various forms of application of chlorine.

(b) A town with population of one lakh is to be supplied with daily at 200 liters per head. The variation in demand follows:

B.E. (Civil)/Fifth Semester/Chance
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG361CI: Water Supply 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 necessary data suitably.

Answer FIVE questions.

1(a) Draw flow diagrams of urban and rural water supply scheme. Describe briefly the activities involved in planning and design of water supply project. 8

(b) Define wholesome and contaminated water. List out the types of water demand and explain any two of them. 8

2(a) What are the various source of water used in the water supply schemes? Discuss their merits and demerits from quality and quantity point of views. 8

(b) The following data shows the variation in population of a town from 1960 to 2010. Find out the population of the town in 2030 by using arithmetical increase and geometrical increase method. 8

Year:	1960	1970	1980	1990	2000	2010
Population:	70000	85000	110000	130000	154000	184000

3(a) Enlist the different methods of Disinfection. Explain break point chlorination. What are the factors affecting bactericidal efficiency of chlorination? 8

(b) The dead end type of distribution pipe network is adopted for supplying water to a certain zone of city having different blocks and their populations as shown in fig. If the rate of water supply is 200 lpcd, design the sizes of pipes AB and B C, The pressure to be maintained each pipe is 12m. Take Hazen William constant=100.R_L of bottom of storage tank (A)= 225.00 m. RL of points along main road A=210m, B=200m, C=195m, Length AB, BC may be taken as 500m, 400m respectively. The distribution system may be designed for maximum demand equal to 2.7 times the average demand. 8
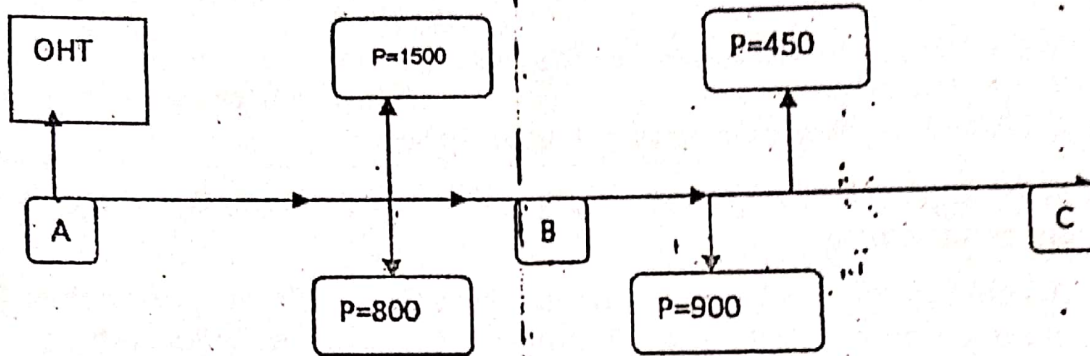
4(a) Differentiate between physical, chemical and biological impurities present in water. Illustrate the membrane filter technique of bacteriological examination. 8

(b) The analysis of water sample shows following results in mg/lit: 8
(i) $Na^+=101.5$ (ii) $K^+=21.5$ (iii) $Ca^{++}=160$
(iv) $Mg^{++}=30$ (v) $HCO_3.=300$ (vi) $NH_4=2$

Calculate total hardness, carbonate hardness and non-carbonate hardness. 8

5(a) Explain different layout of distribution systems. 8

(b) Design-five unit of slow sand filter beds from the following data for the water works of a town of population 80000; per capita demand=135 1pcd; rate of filtration=250 litres/hr/m². Assuming maximum demand 1.7 times the average demand. Out of five units, one is to be kept as stand by and used while repairing other units 8

6. Write short notes on any FOUR: 4×4=16
(a) Public tap stand post
(b) Chemical test of water
(c) Air valve
(d) Hardness of water
(e) Maintenance of water supply system
(f) Gravity water supply system

PURBANCHAL UNIVERSITY
2018

B.E. (Civil)/Fifth Semester/*Final*
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG356CI: Transportation Engineering-I *(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. Use appropriate standard data wherever necessary.

Answer FIVE questions.   5×16=80

1(a) Macadam road construction is more scientific than other method, verify with its cross section.   8

(b) Obligatory points govern the highway alignment, Justify. Give the Cross section of 4 lane city road as per NRS 2045.   5+3

2(a) Describe the curve resistance. Why do we compensate grade in gradient in horizontal curve?   3+3

(b) Design the total length of vertical curve at the VPI at valley side comprising descending gradient of 1 in 40 and an ascending gradient of 1 in 30 if the speed is 100km/hr so as to fulfill both comfort condition and head light sight distance for night driving. Locate the point for drainage consideration and the end of the curve point too. Calculate their elevation if the beginning of the curve is 312.56m above sea level. Assume other necessary data reasonably.   10

3(a) The design speed of a highway is 80 km/hr. There is a horizontal curve of radius 200m on a certain locality. Calculate the super elevation needed to maintain this speed. If maximum super elevation of 0.07 is not be exceeded; calculate the maximum allowable speed on this horizontal curve as it is not possible to increase the radius. Safe limit of transverse coefficient of friction is 0.15.   8

(b) A two lane highway has greater curve road width than in straight section, Explain. By how much the curve road width is greater than straight road section.   3+5

Contd. ...

1 LL4625

4(a) How plantation stabilize unstable slope? Define the purposes of bio-engineering with neat figures.   4+4

(b) Explain with sketches of moisture control to strengthen the sub-grade of an embankment.   8

5(a) What are general lab tests conducted for the determination of hardness, toughness and strength of road aggregates? Describe the lab test for the determination of toughness of the road aggregates.

                                      3+5

(b) Briefly mention the common test on bitumen required to check consistency. What is the importance of flash and fire point test? Describe laboratory process for determining aggregate impact value.

                                      3+5

6. Write short notes on: 4×4=16
   (a) Liquid Bitumen
   (b) Hairpin Bend
   (c) Design of horizontal curve for night visibility consideration
   (d) Aqueducts and inverted syphon

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PURBANCHAL UNIVERSITY
2017

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

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

BEG356CI: Transportation Engineering-I *(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. Use appropriate standard data wherever necessary.

Answer FIVE questions.   5×16=80

1(a) List out the different modes of transportation. Show the comparison between various modes of transportation and their relevance in the context of Nepal.   2+6

(b) What are the requirements of an ideal highway alignment? Describe the information needed to be collected during detailed survey.   2+6

2(a) Determine super elevation required for a curve of 200m radius and design speed 100km/hr. The width of road is 15m. Assume other necessary data.   8

(b) A +2% grade meets -1.25% grade at a chainage of 1+085 at reduced level of 76.55m. If sight distance to be provided 300m, determine length of vertical curve and reduced level of the tangent points and highest point on the curve. (Assume any other data if necessary).   8

3(a) Derive an expression for overturning and skidding of vehicles when travelling along horizontal curves.   8

(b) A four lane divided carriageway has a curve 1000m long and a radius of 550m. The safe stopping sight distance is 250m. Calculate the minimum set back distance from the inner edge of a building to ensure safe visibility. The pavement width per lane is 3.5m.   8

4(a) Explain the methods of sub-surface drainage with neat sketches. 8

(b) Define hair pin bend. Derive an expression for determining the length of unsymmetrical hair pin bend. 2+6

5(a) Explain the laboratory procedure of ductility test of bitumen. Enlist the engineering application of it. 2+6

(b) Explain the laboratory procedure of Crushing value test on aggregate. 8

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

(a) Right of way

(b) Type of gradients

(c) Energy dissipating structure

(d) Cutback bitumen

(e) Classification of roads in Nepal.

PURBANCHAL UNIVERSITY
2016

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

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG356CI: Transportation Engineering-I (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. Use appropriate standard data wherever necessary.

Answer FIVE questions.   5×16=80

1(a) Discuss the constraints of the railway development in Nepal. List the disadvantages of road transportation.   4+4

(b) Classify the roads according to the NRS 2070. Also explain urban road network pattern.   4+4

2(a) Write down the factors that control the highway alignment and describe with necessary sketch.   8

(b) For the design of highway, there are some basic design controls and criterias, what are those? Describe.   8

3(a) What are the elements of cross-section? Show with diagram. Describe the two of them.   8

(b) Define road aggregates. Write down about the tests on road aggregates.   8

4(a) Relation between super elevation, coefficient of friction and centrifugal ratio.   8

(b) Find the length of transition curve using following data:
Design speed= 55km/hr
Radius of circular curve= 240m
Allowable rate of introduction of super elevation (pavement rotated about the centerline)= 1 in 150
Pavement width including extra widening= 7.5 m.

Contd. ...

5(a) What is hill road and highway drainage? Write significant of hill road at the context of Nepal.   2+6

(b) A car travelling at 22.22m/s is overtaking another car moving at 16.67m/s on a two lane two way undivided highway. Assuming an acceleration of the overtaking car as 0.7m/s2. Calculate: 8

(i) Minimum overtaking side distance

(ii) minimum length of overtaking zones

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

   (a) PIEV Process

   (b) Test on Bitumen

   (c) Different types of hill road cross-sections.

   (d) Sub surface drainage system

   (e) Cross drainage structures.

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

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG356CI: **Transportation Engineering-I** *(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. Use appropriate standard data wherever necessary.

Answer FIVE questions.   5×16=80

1(a) Compare and contrast between Road, airways and railway in terms of ubiquity, mobility and efficiency. Present the rationale behind ring road. Briefly discuss the economic role of transportation.   4+1+3

(b) Briefly discuss the factors affecting highway alignment. What is the importance of map study? Describe structure of route location process.   3+2+3

2(a) Define transition curve. What are the objectives of providing such curves? Derive an expression for the determination of length of transition curve by the method of rate of change of centrifugal acceleration. Why is grade compensation required on curves?
                                    1+2+2+1

(b) A two lane highway each 3.6m lanes has a posted speed limit of 80 km/hr and, on one direction, has both horizontal and vertical curves. The length of the horizontal curve is 450m and the central angle is 70 degree, and super elevation provided is 7%. The sight obstruction lies 6m away from the inner edge. A recent daytime crash [driver travelling on inside lane and striking a stationary roadway object] resulted in a fatality and a lawsuit alleging that the 80 kmph posted speed limit is an unsafe speed for the curves in question and was a major cause of the crash. The SSD for the posted speed may be taken as 120m. Comment on the roadway design.   10

3(a) What is super elevation? Derive an expression for retermining the length of valley curve when length is greater than sight distance.

1+3+1

(b) A vertical curve joins a negative 1.2% grade to a + 0.8% grade. The P.I. of the vertical curve is at station 75 + 00 and elevation 50.90 m above sea level. The centerline of the roadway must clear a pipe located at station 75 + 40 by 0.80 m. The elevation of the top of the pipe is 51.10 m above sea level. Determine the minimum length of the vertical curve that can be used.

10

4(a) Differentiate between river route and ridge route. What are the design and construction problems in hill road? Derive an expression for determining the length of symmetrical hair pin bend with a neat sketch.

3+2+4

(b) Briefly mention the harmful effects of water on pavement. Describe the methods to control subsurface water from entering into the pavement.

3+4

5(a) Define dry mix and wet mix. Describe with expressions the method of wet mix design.

2+6

(b) Briefly mention the common test on bitumen required to check consistency. What is the importance of flash and fire point test? Describe laboratory process for determining aggregate impact value.

2+2+4

6. Write short notes on any FOUR:

4×4=16

   (a) Cut-back bitumen
   (b) Introduction to Bio-engineering
   (c) Cross-drainage structures
   (d) Extra-widening
   (e) Classification of road as per NRS

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PURBANCHAL UNIVERSITY
2014

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

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

BEG356CI: Transportation Engineering-I *(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. Use appropriate standard data wherever necessary.

Answer FIVE questions.   **5×16=80**

1(a) Mention which mode of transportation is suitable for Nepal and why? Classify the roads as per NRS on the basis of service. Explain Macadam Construction with figure.   2+2+4

(b) What are ring roads? Explain the stages of Engineering Survey for road alignment.   2+6

2(a) Define Shoulder and Super elevation. Derive an expression for the determination of extra widening on pavement on horizontal curves.   2+6

(b) The speed of overtaking and overtaken vehicles are 80kmph and 50 kmph respectively on a two way traffic road. If the acceleration of the overtaking vehicle is 4 kmph/sec,

(a) Calculate the safe OSD

(b) Determine the minimum length of overtaking zone.

Also draw the figure showing overtaking zone with the position of sign posts.   8

3(a) Explain briefly the design controls and criteria of geometric design. For a bituminous road of 4 lanes a 3% slope for camber is provided. What should be the height of crown, if provided with   4+4

(i) Straight Line Camber

(ii) Parabolic Camber

Contd. ...

(b) Calculate the length of transition curve and required shift if the design speed of 70kmph and radius of circular curve as 200m. An allowable rate of change of centrifugal acceleration is 0.6m/s³. Allowable rate of change of super elevation is 1 in 20. The pavement width including extra widening is 7.5m.   8

4(a) What are the typical cross sections of hill roads? Illustrate with figures.   8

(b) Define Surface Drainage. Explain the methods of controlling the subsurface water with figures.   8

5(a) What are the desirable properties of road aggregates? List out the tests on road aggregates and explain Crushing Test.   2+6

(b) What do you mean by 80cm ductility value of bitumen? Explain the procedure for carrying out the Penetration Test of bitumen in laboratory.   2+6

6. Write short notes on any FOUR: 4×4=16
   (a) PIEV Theory
   (b) Hair Pin Bends
   (c) Types of Culverts
   (d) Bioengineering and its techniques
   (e) Surface and Sub Surface Drainage
   (f) Cutback Bitumen and Bituminous emulsion

PURBANCHAL UNIVERSITY
2013

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

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

BEG356CI: Transportation Engineering-I *(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. Use appropriate standard data wherever necessary.

Answer FIVE questions.

1(a) List out the different modes of transportation. Show the comparison between various modes of transportation and their constraints in the context of Nepal.   2+6

(b) What are the requirements of an ideal highway alignment? Describe the information needed to be collected during reconnaissance survey?   2+6

2(a) Calculate the minimum sight Distance required to avoid a head-on collision of two cars approaching from the opposite directions at 80 kmph and 50 kmph. Assume a reaction time of 2.5 seconds, coefficient of friction of 0.7 and a brake efficiency of 50 percent. in either case.   8

(b) An ascending gradient meets the descending gradient: the grades are 5% and 4% respectively. Locate the chainage at the beginning and end of vertical curve. Calculate the elevation of the road at a distance of 100m on right side of the point of vertical intersection (PVI). If the elevation and chainage of the PVI is 2000.50m and 5+100 respectively. Assume R=8000m.   8

3(a) Calculate the safe overtaking sight distance for a design speed of 90 kmph. Assume all other data suitably. Also mention the minimum length of overtaking zone with neat-sketch & show the positions of the sign posts.   8

(b) A national highway passing through rolling terrain in heavy rain fall area has a horizontal curve of radius 550m. Design the length of transition curve assuming suitable data. 8

4(a) What do you mean by bio-engineering? Mention the scope and benefits of it regarding Highway construction in Nepal? 2+6

(b) Define Hair pin bend. Derive an expression for determination of the length of hair pin bend? 2+6

5(a) Briefly explain the- desirable properties of road aggregates. 8

(b) What is bituminous mix? Write down the design procedure of bituminous mix? 8

6. Write short notes on any FOUR: 4×4=16
   (a) Extra-widening
   (b) Classification of Roads in Nepal
   (c) Energy dissipating structures
   (d) Cutback bitumen
   (e) Sub-surface drainage

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PURBANCHAL UNIVERSITY
2012

B.E. (Civil)/Fifth Semester/Final
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG364CI: Transportation Engineering-I

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. Use appropriate standard data wherever necessary.

Answer FIVE questions.

1(a). Describe different modes of transportation. Explain why road transportation is most popular among all.   8

(b) What are the factors controlling highway alignment? Describe the objectives of preliminary survey for highway location.   8

2(a)   What are the special structures constructed in hill roads? Write down their functions.   8

(b)   Derive an expression for calculating the overtaking sight distance on a highway.   8

3(a)   What are the different types of cross sections of hill road? Explain them briefly with neat sketches.   8

(b)   Explain the different types of test carried out on road aggregates.   8

4(a)   A valley curve is formed by a descending grade of 1 in 20 and an ascending grade of   in 40. Design the length of valley curve to fulfill both comfort condition and head light sight distance requirements for a design speed of 80 kmph. (Assume allowable rate of change of centrifugal acceleration C=0.6 m/sec³, reaction time t=2.5sec and coefficient of friction f=0.35.   10

(b)   What are the requirements of good highway drainage?   6

5(a)   Explain camber. What are the disadvantages of steep camber?   6

Contd. ...

(b) A two lane national highway passing through a plain terrain has a design speed of 80kmph. There is a horizontal curve of radius 600m. If the rate of introducing super elevation is 1 in 80 and the length of wheel base of the vehicle expected on the highway is 6.0m, Calculate a suitable length of transition curve. (Assume necessary data suitably) 10

6(a) How the sub-surface drainage system is provided to lower the water table and control seepage flow? Make suitable sketches 8

(b) Explain different types of bituminous materials used in road construction. 8

7. Write short notes on any FOUR: 4×4=16
   (a) Penetration test
   (b) Grade compensation on horizontal curve
   (c) Classification of roads as per NRS
   (d) Reconnaissance survey
   (e) Culverts
   (f) River route

PURBANCHAL UNIVERSITY
2018

B.E. (Civil)/Fifth Semester
Time: 03:00 hrs.
BEG352CI: Soil Mechanics (New Course)

Full Marks: 80 /Pass Marks: 32

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. All notations are as usual. Assume any data if necessary.

Answer FIVE questions.   5×16=80

1(a) Differentiate between compaction and consolidation. Define air void line and zero-air void line. Draw ZAV-line in curves of standard proctor test and modified proctor test. What are the factors affecting compaction?   2+2+2+2

(b) Soil is to be excavated from a borrow pit which has a density of 17.66 kN/m3 and water content of 15%. The specific gravity of soil particle is 2.65. The soil is compacted so that water content is 17% and dry density is 16 kN/m³. For 1000 cum of soil infill, estimate: 8

(i) Quantity of soil to be excavated from the pit in cum.

(ii) The amount of water to be added. Also determine the void ratios of the soil in borrow pit and fill.

2(a) What is Darcy's law? Define permeability of soil. Describe the procedure of determining the coefficient of permeability of a soil using variable head method.   1+2+5

(b) In a consistency limit test, the following data are obtained:

Weight of crumbled thread of 3mm diameter= 23.2 gms

Weight of oven dried thread= 18.2 gms

Liquid limit of the soil= 64.5%

Determine:

(i) Plastic limit and plasticity index

(ii) Soil classification as per USCS and provide appropriate symbol

$wp = L.L - PL$

$IC = 2.303 \frac{a l}{A t} log(h_1/h_2)$

8

Contd. ...

3(a) What is seepage? Define the term flow net. Derive an expression to calculate the seepage discharge from a flow net. 1+2+5

(b) Granular soil deposit is 7 m deep over an impermeable layer. The groundwater table is 4m below the ground surface. The deposit has a zone of capillary rise of 1.2m with a saturation of 50%. Plot the variation of total stress, pore water pressure and effective stress with depth of deposit. $e = 0.6$ and $G_s = 2.65$. (Assume that the top layer is dry). 8

4(a) Define pressure bulb. Derive the expression for vertical stress due to concentrated load Q. 2+6

(b) A saturated specimen of cohesionless soil was tested under drained conditions in a tri-axial compression test apparatus and the sample failed in a deviator stress of 482 kg/cm^2 and the plane of failure makes an angle of 60 degree with the horizontal. Find magnitude of the principal stresses. What will be value of deviator stress and major principal stress at failure for another identical soil, if it is tested under a cell pressure of 200 kN/m^2? 8

5(a) There is a 10m thick layer of impervious clay with layers of sand on either side. An undisturbed sample from the above impervious clay was taken and tested in laboratory. It was found that it took 22.5 minutes to obtain 50% consolidation for a sample of 3cm thickness having drainage on both sides. Corresponding time factor $T_{50} = 0.197$. It is proposed to construct a building on the above strata. Find out the time which will elapse according to the Terzaghi's theory of consolidation until 50 and 90% of final settlement will be reached. 8

(b) What are different types of slope failure? Explain the remedial measures of slope failure. 4+4

6. Write short notes on any FOUR: 4×4=16
   (a) Quick sand condition
   (b) Classification of tri-axial tests according to drainage condition
   (c) Log time method of determination of co-efficient of consolidation
   (d) Design of filters
   (e) Zero air void line

B.E. (Civil)/Fifth Semester
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG352CI: Soil Mechanics *(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. All notations are as usual. Assume any data if necessary.

                                                                        5×16=80

Answer FIVE questions.

1(a) Define ZAV line. Plot it in a standard proctor test and made of proctor test curve. Differentiate between compaction and consolidation. State the factors affecting compaction of soil. (4)
                                                                        1+2+2+3

(b) A soil has a porosity of 35%, the specific gravity of solids of 2.70 and a water content of 10%. Determine the mass of water required to be added to 100m³ of this soil for full saturation. (8)   8

2(a) Define permeability. Explain Darcy's law. Derive the expression for determination of coefficient of permeability by falling head method. (5)   1+2+5

(b) From the test on a fine grained soil the following data has been obtained: 8

Liquid limit=40%,   Plastic limit=25%

Moisture content= 30%.

Determine liquidity index and also classify the soil according to USCS.

3(a) What is a flow net? Describe its properties and applications.   2+2+4 (2)

(b) A sand deposit has two layers. The top layer is 3m thick (Υ=17KN/m³) and bottom layer is 4m thick (Υ_{sat}=20KN/m³). The water table is 4m from the surface and zone of capillary action is 1m above the water table. Draw the diagrams showing the variation (8) of total stress, pore water pressure and effective stress.   8

                                                                    Contd. ...

4(a) What are assumptions of Bousinesq equations. Derive the expression for vertical stress due to circular load. 2+6

(b) A sample of dry cohesionless soil was tested in a triaxial machine. If angle of shearing resistance was 36° and the confining pressure was 100 KN/m², determine the deviator stress at which the sample failed. 8

5(a) Discuss the various methods for improving the stability of slope. 8

(b) A stratum of clay is 2m thick and has an initial overburden pressure of 50KN/m2 at its middle. Determine the final settlement due to an increase of pressure of 40KN/m². The clay has preconsolidation pressure of 75K/m². Take e_o=1.30, C_r=0.05, C_c=0.25. 8

6. Write short notes on any FOUR: 4×4=16
   (a) Importance of soil mechanics
   (b) Determination of Cv by casagrande method
   (c) Design of graded filter
   (d) Effect of variation of water-table in effective stress within the soil layer
   (e) Unconfined compression test

B.E. (Civil)/Fifth Semester
Time: 03:00 hrs.

BEG352CI: **Soil Mechanics** *(New Course)*

Full Marks: 80 /Pass Marks: 32

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. All notations are as usual. Assume any data if necessary.

Answer FIVE questions.   5×16=80

1(a) Discuss the types of failures with figure and also recommend different remedial measures for slope instability.   4+4

(b) A soil in borrow area has a natural water content of 10% and bulk density of 1.8 gm/cm3. The soil is used for an embankment to be compacted at 20% moisture content to a dry density of 1.9 gm/cm3. Determine the amount of water to be added to 1m3 of borrow area soil. How many cubic meter of excavation is required for 1m3 of compacted embankment?   8

2(a) Write about dilatancy test? Explain about Unified Soil Classification System (USCS) and also draw its plasticity chart. 2+6

(b) List the factors affecting the coefficient of Permeability? A layer of sand 6m lies beneath a clay stratum 5m thick and above a thick shale. In order to determine the permeability of the sand a well was driven to the top of the shale and water pumped out at the rate of $10×10^{-3}$ cum/sec. Two observations wells were driven through the clay at 15m and 30m from the pump well and draw downs in the wells were found to be 3m and 2.5m respectively. Calculate the coefficient of permeability?   3+5

3(a) A sample soil was prepared by mixing a quantity of dry soil with 10% by mass of water. Find the mass of this wet mixture required to produce a cylindrical, compacted specimen of 15cm diameter and 12.5 cm deep and having 6% air content. Find also the void ratio and the dry density.   8

(b) Define flow net and list its applications. Using flow net diagram; derive the relation to determine the seepage discharge through earth mass.
2+2+4

4(a) A sand deposit is 10 m thick and overlies a bed of soft clay. The ground water table is 3m below the ground surface. If the sand above the ground water table has a degree of saturation of 45%. Plot the diagram showing the variation of the total stress, pore water pressure and the effective stress. The void ratio of the sand is 0.7 and Take G=2.65
8

(b) What are the assumptions in Bousinesq equations. Derive the expression for the vertical stress under uniformly loaded circular area.
2+6

5(a) Define pre-consolidation pressure, normally consolidated and over consolidated soils? An area is underlain by a stratum of clay layer 6m thick. The layer is doubly drained and has the coefficient of consolidation of 0.3m2/month. How long would it take for a surcharge load to cause a settlement of 40cm if the same load causes a final settlement of 60cm?
3+5

(b) Write about Mohr-Coulomb failure theory. Derive the relation between principal stresses at failure.
3+5

6. Write short notes on any FOUR:
4×4=16
   (a) Sand replacement method
   (b) Zero air void line
   (c) Importance of soil and soil problems.
   (d) Quick sand condition
   (e) Direct shear test

PURBANCHAL UNIVERSITY
2015

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

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG352CI: Soil Mechanics *(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. All notations are as usual. Assume any data if necessary.

Answer FIVE questions.

5×16=80

1(a) How soil is classified according to texture? List out the differences between AASHTO and USCS soil classification system. 3+5

(b) In order to find the relative density of sand, a mould of volume 1000ml was used. When the sand was dynamically compacted in the mould its mass was 2.10kg, whereas when the sand was poured in loosely its mass was 1.635kg. If the insitu density of the soil was 1.50 Mg/m³, calculate the relative density, G=2.70. Assume that the sand is saturated. 8

2(a) List out the factors affecting the permeability of soil. What are laboratory methods for the determination of coefficient of permeability of soil? Explain any one of them. 2+1+5

(b) A long natural slope is subjected at 10° to the horizontal. The water table is at the surface and seepage is roughly parallel to the slope. A slip surface is found to develop at the depth of 5m on a plane parallel to the slope. If the strength parameters are C= 100KN /m³ and $\emptyset$= 26°. Determine FOS. By what percentage the factor of safety would be change if the water table in the slope is absent? Take Y_{sat}= 20 KN/m³ Y_d=17 KN/m³. 8

3(a) What are flow lines and equipotential lines. Derive that the expression for the phreatic line in a homogeneous dam. 2+6

(b) A soil profile consists of a surface layer of sand 3m thick (y=17KN/m³), an intermediate layer of clay 3m thick (y=9KN/m³), and the bottom layer of gravel 3m thick

Contd. ...

(γ=18.5KN/m³). The water level is at the upper surface of the clay layer. Determine the effective pressure at various levels immediately after the placement of a surcharge load of 59 KN/m² at the ground surface. 8

4(a) What are the assumptions made by Boussinesq for the stress distribution in an elastic medium subjected to a concentrated load on its surface. Determine the vertical stress at point P when the point P lies vertically below the line load. 2+6

(b) In an unconfined compression test, a sample of sandy clay 8cm long and 4cm in diameter fails under a load of 10% strain. Compute the shearing resistance taking into account the effect of change in cross-section of the sample. 8

5(a) Explain the square- root of time method of determination of coefficient of soils with its expression. 8

(b) A sample of soil was prepared by mixing a quantity of dry soil with 12% by mass of water. Find the mass of this wet mixture required to produce a cylindrical, compacted specimen of 15cm diameter and 12.5cm deep and having 6% air content. Find also the void ratio and the dry density of specimen if G=2.68. 8

6. Write short notes on any FOUR: 4×4=16
(a) Sand grain properties and index properties
(b) Unique nature of soil
(c) Quick sand condition
(d) Moisture density relationships
(e) Differences between consolidation and compaction of soil

PURBANCHAL UNIVERSITY
2014

B.E. (Civil)/Fifth Semester

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG352CI: Soil Mechanics *(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. All notations are as usual. Assume any data if necessary.

Answer FIVE questions.   5×16=80

1(a) Differentiate between compaction and consolidation. List out the factors affecting compaction of soil. Write salient features of compaction curve with neat sketch showing zero air void line?   3+1+4

(b) An undistributed specimen of clay was tested in a laboratory and following results were obtained:

Wet mass= 210gm

Oven dry mass= 175gm

Sp. gr. of solids= 2.7

What was the total volume of the original undistributed specimen assuming that the specimen was 50% saturated?   8

2(a) State the factors affecting coefficient of permeability. Derive the expression for the determination of permeability by pumping out test through unconfined aquifer.   2+6

(b) From the consistency limit test on a fine grained soil the following data has been obtained:

LL =62.5% PL=34.7%

Moisture content= 37.5%. Determine liquidity index, consistency of soil and also classify the soil according to USCS.   8

3(a) What are the application of flow net? Derive the Laplacian equation for two dimensional flows.   2+6

(b) A sand deposit consists of two layers. The top layer is 3m thick (ρ=1709.67kg/m³) and bottom layer is 3.5m thick (ρsat= 2064.52kg/m³). The water table is at a depth of 4m from the surface and the zone of capillary action is 1m above the water table. Draw the diagrams showing the variation of total stress, pore water pressure and effective stress.   8

4(a) Derive the expression for the vertical stress under uniformly loaded circular area.   8

(b) Two triaxial test were done on a soil sample. In the first test all round pressure was 2.4 kg/cm² and the failure occurred at an added axial stress of 7.5 kg/cm². In another test all round pressure was 4 kg/cm² and the failure occurred an axial stress of 16 kg/km². Determine the values of cohesion and angle of friction failure.   8

5(a) Explain the casagrande's logarithm time method of determination of consolidation coefficient of soils with its expression.   8

(b) A slope of very large extent of soil with properties c'=0 and Φ'=32° is likely to be subjected to seepage parallel to the slope with water level at the surface. Determine the maximum angle of slope for a factor safety of 1.5 treating it as an infinite slope. For this angle of slope what will be the F.O.S if water level were to come down well below the surface? The saturated unit wt. of soil is 20KN/m³.   8

6.   Write short notes on any FOUR: 4×4=16
    (a) Unconfined compression test
    (b) Factors affecting compaction of soil
    (c) Variation of effective stress due to change in water table within the soil.
    (d) Design of Graded filter
    (e) Effect of compaction on the Engineering behavior of soil

(2)

(b) Soil sample collected from the field gave following laboratory test result:

Percentage passing No. 4 sieve	=100%
Percentage passing No. 200 sieve	=76%
Liquid limit	=62.5%
Plastic limit	=34.7%
Moisture content	=37.5%

Determine liquidity index, consistency of soil and also classify the soil according to USCS. 8

4(a) List out the characteristics of flow net? Explain the applications of flow net. 2+6

(b) A point load of 2500 kN acts on the surface of earth: 8
(i) Show the variation of vertical stress on a horizontal plane at a depth of 3m below the surface.
(ii) Show the variation of vertical stress on a vertical plane at r=2m. 8

5(a) State Mohr-Coulomb theory. Derive the relation between principal stresses at failure. 3+5

(b) A long natural slope of clay with soil properties c'=18kN/m², Φ'=25° γsat=20kN/m² and slope angle of 15° with horizontal. If the translational slip plane had developed at a depth of 6m below the surface, determine the stability of slope if water table is at the surface and seepage is parallel to the slope. 8

6(a) Define primary consolidation of soil. Explain Terzaghi's spring analogy for primary consolidation. 3+5

(b) Pore pressure measurements were made during consolidated-undrained triaxial tests on samples of compacted fill material from an earth dam. The results were as follows:

Cell pressure kN/m²)	100	200	300
Deviator stress at failure (kN/m²)	290	400	534
Pore water pressure at failure (kN/m²)	20	70	136

Plot the strength envelope in terms of total stress and effective stress and determine the shear strength parameters with respect to total stresses and effective stresses. 8

PURBANCHAL UNIVERSITY
2013

B.E. (Civil)/Fifth Semester/Final
Time: 03:00 hrs.   Full Marks: 80 /Pass Marks: 32
BEG352CI: Soil Mechanics (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. All notations are as usual. Assume any data if necessary.

Answer FIVE questions.

1(a) State Mohr-Coulomb failure theory. Derive the relation between principal stresses at failure. 2+6

(b) Two soils were tested for their consistency limits in the laboratory. The following data were obtained: 2+2+2+2

Soil A		Soil B	
No. of blows (N)	Water content (%)	No. of blows (N)	Water content (%)
8	43	5	65
20	39	15	61
30	37	30	59
45	35	40	58
Plastic limit= 25%		Plastic limit= 30%	
Natural moisture content= 40%		Natural moisture content= 50%	

(i) Which soil has greater plasticity?

(ii) Which soil is more compressible?

(iii) Which soil shows a higher rate of loss in shear strength upon increase in water content?

(iv) Which soil has a higher strength at plastic limit?

2(a) Explain the process of determining the coefficient of consolidation using square root of time and logarithm of time methods. 8

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(b) The following data refers to a light compaction test.

Water content (%)	8.5	12.2	13.75	15.5	18.2	20.2
Mass of wet sample (kg)	1.80	1.94	2.00	2.05	2.03	1.98

If the specific gravity of soil grains is 2.7 and volume of mould is 1000cc. Plot the compaction curve and obtain the maximum dry density and optimum moisture content. Plot the 80 percent and 100 percent saturation lines. Would the 20 percent air voids curve be the same as the 80 percent saturation curve? 8

3(a) Define flow net and mention its properties. Using flow net diagram, derive the relation to determine the seepage discharge through an earth mass. 3+5

(b) Classify the Soil A and Soil B on the basis of data provided, as per Unified Soil Classification System. 4+4

Soil	Liquid limit (%)	Plastic limit (%)	% retained on 4.75 mm, sieve	% passing through 4.75 mm sieve	% passing through 75 micron sieve
A	34	20	0	20	80
B	35	20	60	20	20

4(a) Derive the expression to calculate the vertical stress at due to a concentrated load Q at a point P at a depth Z and radial distance R from the point of application of load. 8

(b) The following data were recorded in a constant head permeability test:

Internal diameter of permeameter = 7.5 cm
Head loss over a sample length of 18 cm = 24.7 cm
Quantity of water collected in 1 min = 626 ml
Porosity of soil sample = 44%

Calculate the coefficient of permeability of the soil, discharge velocity and seepage velocity during the test. 8

5(a) What are the causes of slope instability in Nepal? Explain the different types of slope failures. Describe the different remedial measures for slope instability. 2+3+3

(b) The water table in a deposit of sand 4 m thick is at a depth of 2m below the ground surface. Above the water table, the sand is saturated with capillary water. The bulk unit weight of sand is 20kN/m³. Calculate the effective stress at 1m, 2m and 4m below the surface. Also plot the variation of total stress, neutral stress and effective stress over the depth of 4m. 8

6. Write short notes on any FOUR: 4×4=16
(a) Quick sand condition
(b) Importance of soil mechanics to civil engineers
(c) Differences between compaction and consolidation
(d) Shear strength of sands
(e) Factors affecting the coefficient of permeability

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. All notations are as usual. Assume any data if necessary.

Answer FIVE questions.

1(a) Explain the historical development of soil mechanics in brief.   5

 (b) With the help of phase diagram prove that: 3

  $S_r.e = w.G$, where the symbols carry their usual meaning

 (c) A sample of soil compacted according to standard proctor test has a unit weight of 20 kN/m³ at 100% compaction. The optimum water content is 15%. What is the dry unit weight? What is the dry unit weight at zero air voids? If the voids become filled with water, what would be the saturated unit weight? Assume G= 2.67.   8

2(a) Differentiate between compaction and consolidation. Explain the process of determining the coefficient of consolidation using logarithm of time method.   3+5

 (b) From the consistency limit test on a fine grained soil the following data has been obtained:

  LL =62.5%   PL=34.7%   Moisture content=37.5%

  Determine liquidity index, consistency of soil and also classify the soil according to Unified Soil Classification System.   8

3(a) Define permeability of soil. Explain the factors affecting coefficient of permeability.   2+6

(b) At a particular site lies a layer of fine sand 8 m thick below the ground surface and having a void ratio of 0.7. The GWT is at a depth of 4 m below the ground surface. The average degree of saturation of the sand above the capillary fringe is 50%. The soil is saturated due to capillary action to a height of 2.0 m above the GWT level. Assuming $G_s=2.65$, calculate the total effective pressures at depths of 6 m and 3 m below the ground surface and draw the pressure distribution diagram. 8

4(a) List out the characteristics of flow net? Explain the applications of flow net. 2+6

(b) A long natural slope of clay with soil properties $c'=18kN/m^2$, $\Phi'=25°$, $\gamma_{sat}=20 \ kN/m^2$ and slope angle of 15° with horizontal. If the translational slip plane had developed at a depth of 6m below the surface, determine the stability of slope if water table is at the surface and seepage is parallel to the slope. 8

5(a) State Mohr Coulomb failure theory. 3

(b) Derive the relation between principal stresses at failure. 5

(c) A point load of 5000 kN acts on the surface of earth: 8

(i) show the variation of vertical stress on a horizontal plane at a depth of 4m below the surface.

(ii) show the variation of vertical stress on a vertical plane at r=1 m.

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

(a) Terzaghi's Spring Analogy for consolidation

(b) Design of filter

(c) Shear strength of sand

(d) Index properties of fine grained soil

(e) Sand Replacement Method

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

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

**BEG354CI: Theory of Structure-II** *(New Course)*

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

The figures in the margin indicate full marks.

4×20=80

Answer FOUR questions.

1. Using Force method, analyze the given truss. Determine the actual member forces if the member 3 get rise in temperature by 20°C and the member 10 is 3mm short while fabrication, sectional area of each member is 50mm². Take $\alpha = 11 \times 10^{-6}/°C$ and E=210 GPa.   20
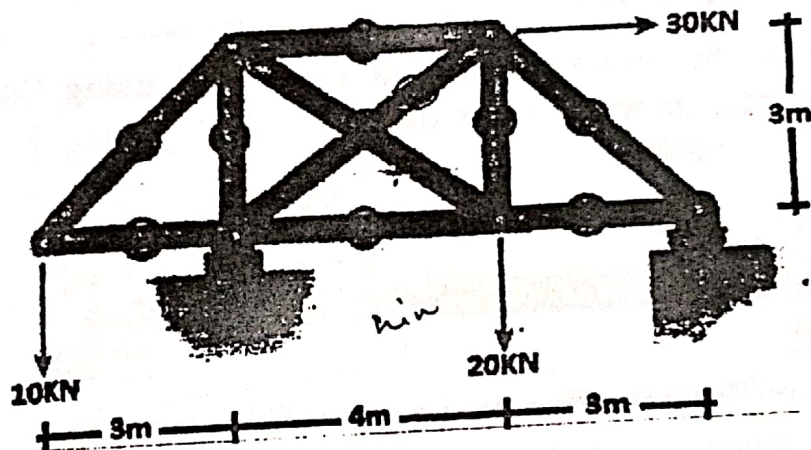
2. Analyze the give beam using Slope Deflection method. Here, support A settles downward by 2.5mm, whereas support B sinks by 3.5mm and also allows support C, an anticlockwise rotation of (1/15)°. Draw BMD. Take E=200GPa and $I=2.5 \times 10^4$ cm⁴.   20
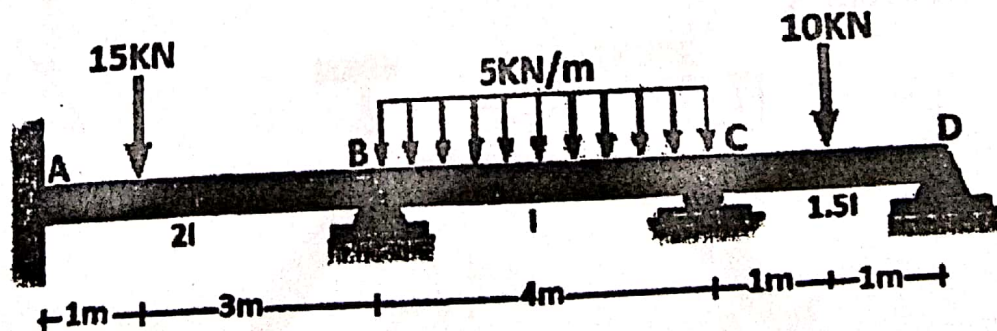
Contd. ...

3. Analyze the given frame by moment distribution method and draw BMD.   20
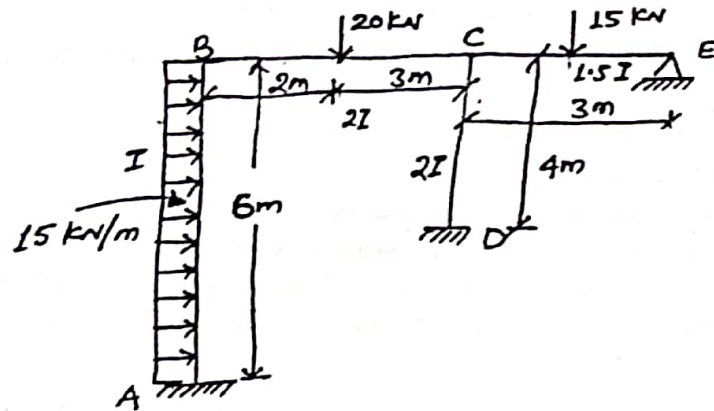
4(a) Determine the reaction force at support C using Castigliano's theorem of least work. Draw BMD.   8
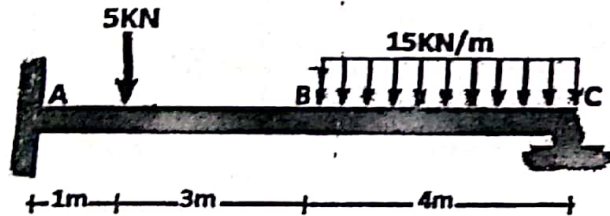
(b) A two hinged parabolic arch of rise 18m and span 80m being loaded as shown in figure. Assume for rib shortening, temperature rise of 10°C and yield of end supports of 0.7×10^{-5} m/kN. Also, assuming secant variation, calculate the horizontal thrust. Take $I_c = 0.9 \times 10^{-3}$ m⁴, $A_m = 0.25 m^2$, E=200GPa, $\alpha = 1.2 \times 106/°C$.   12
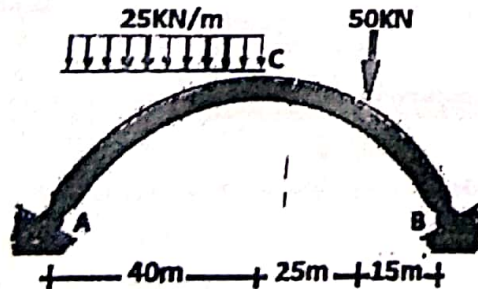
5. Using Stiffness matrix method analyze the given frame. Also d BMD.
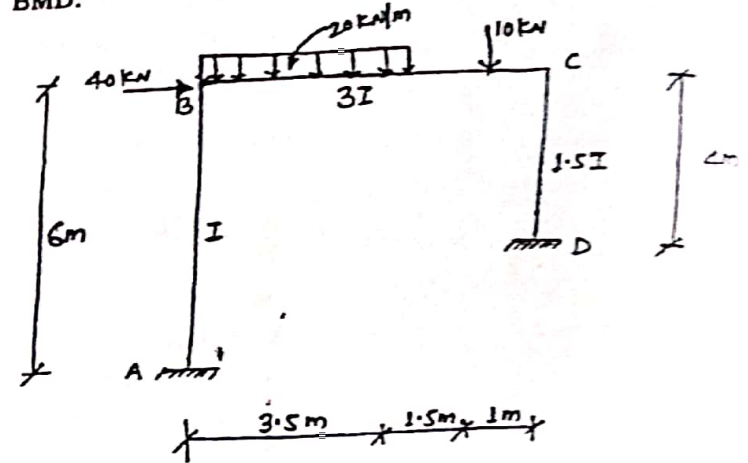
6(a) Draw the influence line diagram for the bending at D of continuous beam. Compute ordinates at 1m interval. Use M. Breslau's principle.
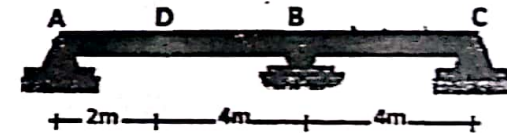
(b) Determine the plastic moment capacity of the given frame
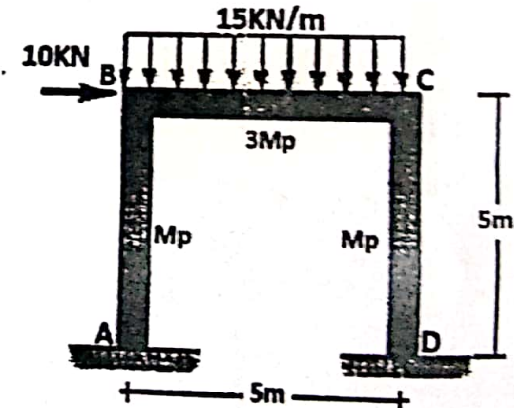
PURBANCHAL UNIVERSITY
2017

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

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

BEG354CI: Theory of Structure-II *(New Course)*

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

· *The figures in the margin indicate full marks.*

Answer FOUR questions.   4×20=80

1(a) Determine the degree of static and kinematic indeterminacies of the given structure.   6
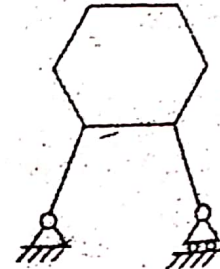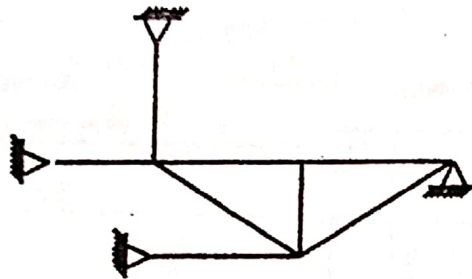
(b) Using consistency deformation method to analyze the frame as shown in figure.   14
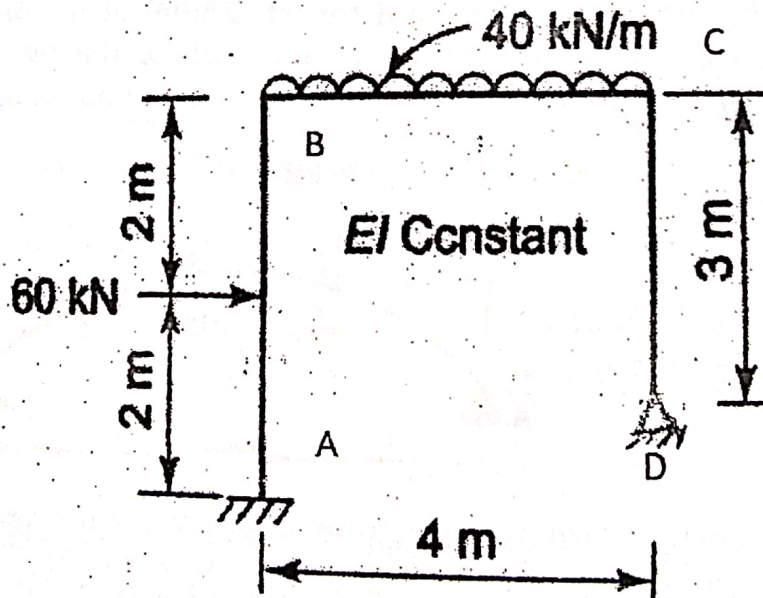
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2. Analyse the structure given by slope deflection Method and draw BMD diagram. When end A rotate through 1/20 anticlockwise and support B move downward by 2 cm, take E=2×10⁵MPa, I=4×10⁷mm⁴.   20
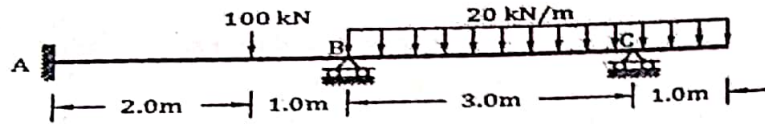
3. Using moment distribution method analyze the frame shown in figure.   20
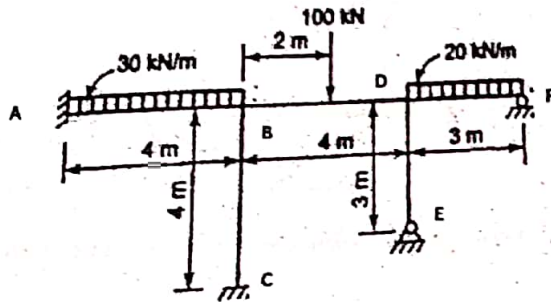
4(a) Calculate the horizontal thrust, Radial shear and normal thrust at a section of 5m from left support for the two hinged parabolic arch with secant variation of section as shown in fig below: 10
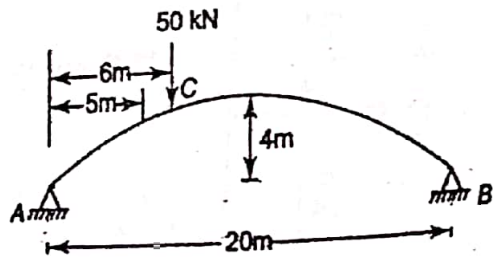
(b) Compute the influence line diagram for the reaction at A for the continuous beam shown in figure at 2m interval. Consider moment of inertia is same throughout.   10
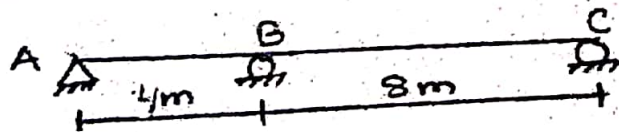
5. Analyze the frame by stiffness matrix method and draw bending moment diagram.   20
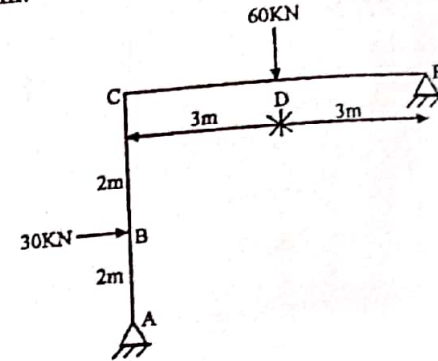
6(a) Using Castigliano's method determine the deflection at point C. Take EI =1400KNm².
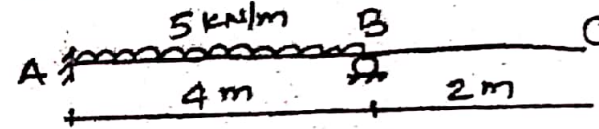
(b) Determine the plastic moment capacity for the frame loaded shown in the figure.
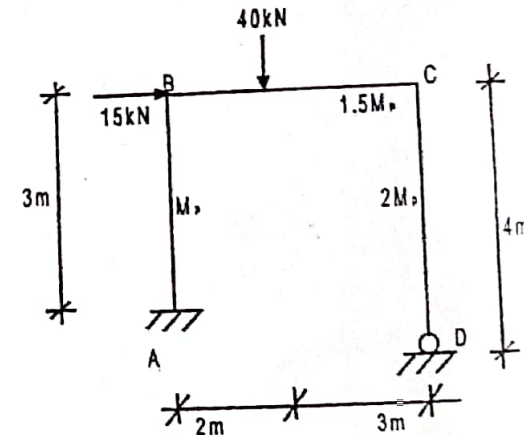
PURBANCHAL UNIVERSITY
2016

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

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

BEG354CI: Theory of Structure-II *(New Course)*

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

The figures in the margin indicate full marks.

Answer FOUR questions.   4×20=80

1(a)   Determine the static in determinacy (external and internal) and kinematic in determinacy (extensible and inextensible) for the given structure.   6
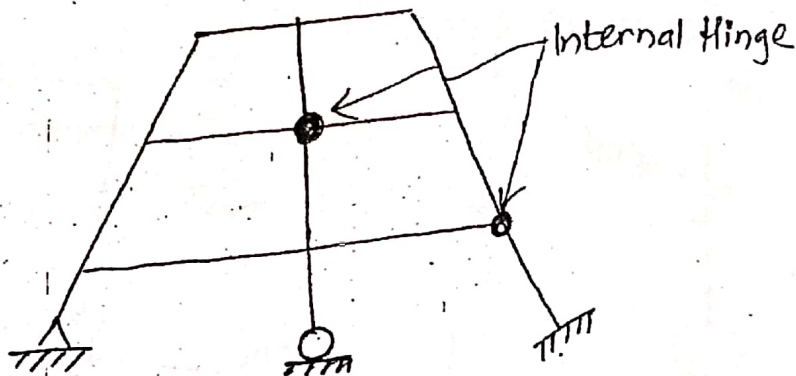
(b)   Using Castigliano's theorem, determine the vertical deflection at the 50KN load in the beam shown in figure below.   14
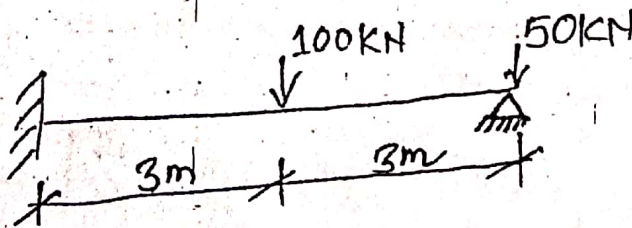
$E = 211000 N/mm^2$
$I = 46875 \times 10^4 mm^4$

2.   Analyze the beam shown in figure below by slope deflection method. Draw BM diagram considering given external loading and rotation of support 'D' by $(1/10)°$ clockwise, support 'C' settles down by 4mm. EI Assume.   20

Contd

25KN   50KN 40KN   10 KN/m
A ↓   C ↓   ↓ D↓ ↓ ↓ ↓ ↓ ↓ ↘ B
   EI   2.5EI   3EI
   |← 3m →|← 2m →|← 2m →|← 2m →|← 6m →|
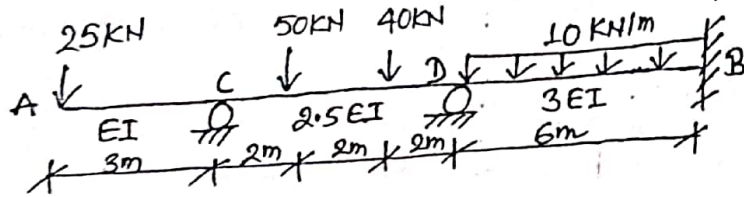
3. Analyze the given frame using stiffness matrix method. Draw BMD also.   20

40KN/m
EI Constant

2m

2m

1m   60KN →

← 60KN

4m   2m
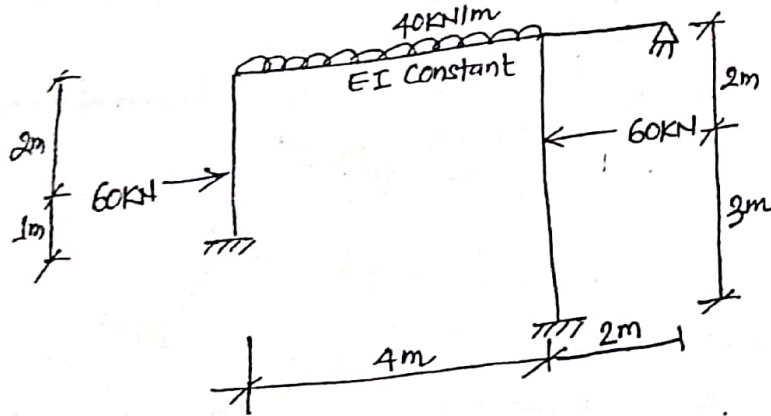
4 Using force method to solve the frame as shown in figure below: 20

20kN 48KN-m
2EI

EI

30KN/m 4m

6m   EI

1m   3m
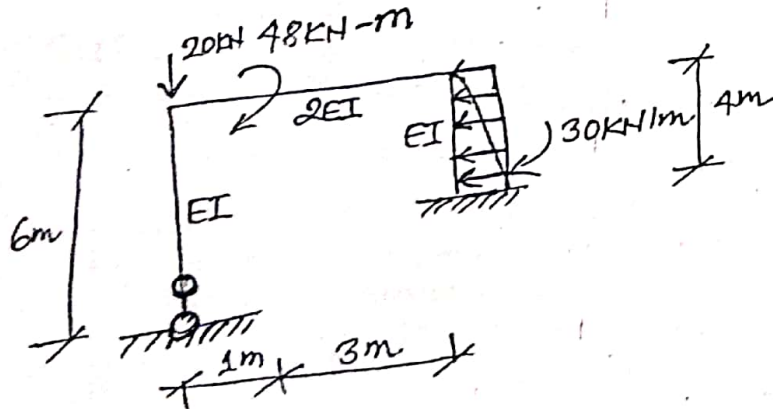
Contd

5. Analyze the frame loaded as shown in figure below using moment distribution method. Draw BM diagram. Take EI as constant.

20KN   6KN/m
       I   2I
           2m
           3I
5KN ←   2m

|← 2m →|← 3m →|← 9m →|
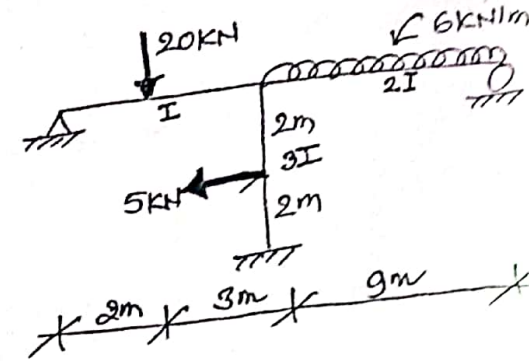
6(a) Draw influence line diagram for the reaction at 'B' of the propped cantilever beam shown in figure below. Find the ordinates at 2 interval.

A   10m   B
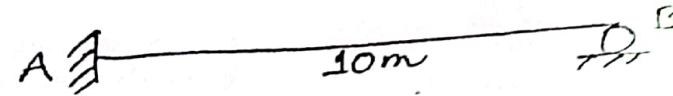
(b) Calculate the collapse moment after establishing possible failure mechanism for the portal frame shown in figure below.
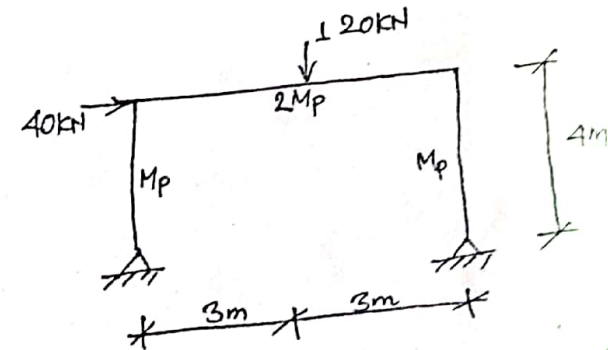
                 20KN
40KN →   2Mp
                              4m
      Mp   Mp

      3m   3m

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

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

BEG354CI: Theory of Structure-II *(New Course)*

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

The figures in the margin indicate full marks.

Answer FOUR questions.   4×20=80

1. Using consistent deformations method, analyze the frame shown in Fig. (1). Draw the bending moment & shear force diagram.   20

Fig.1
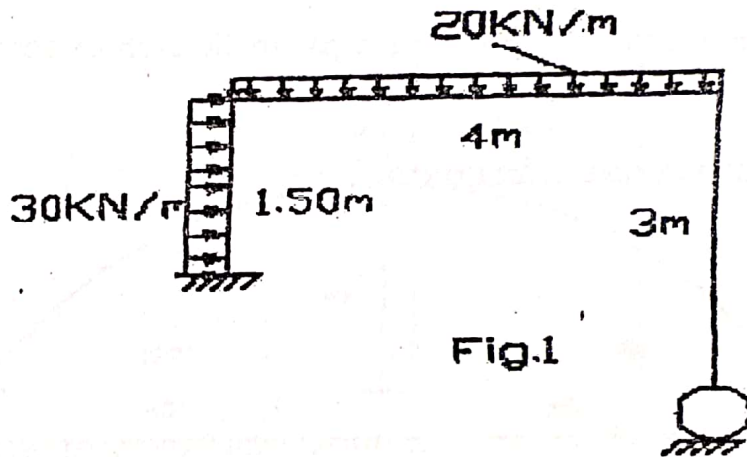
2. Determine moment at joints if supports B & C sink by 10mm & 12mm respectively. Take $1=800cm^4$ and $E=2×10^5$ N/mm². Also draw bending moment diagram.   20
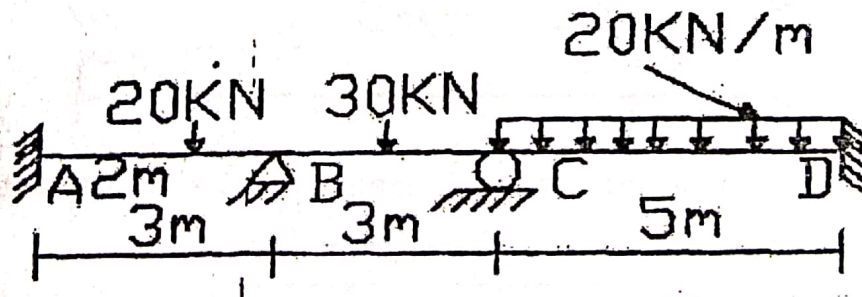
3. Analyze frame by moment distribution method and draw bending moment diagram. 20

Fig.3
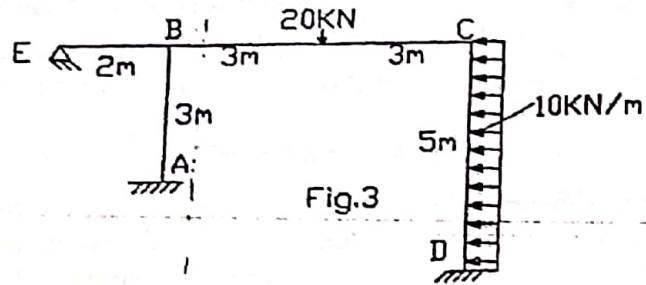
4(a) Find the reactions of two hinged parabolic arch as shown. 8
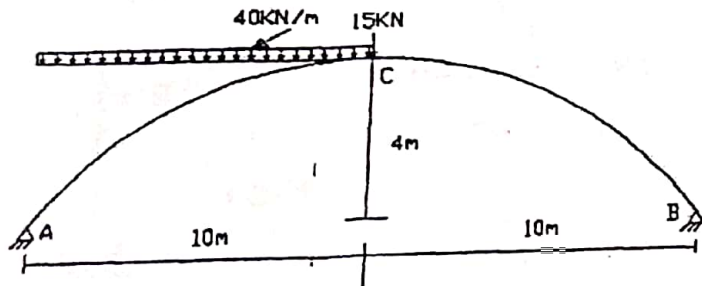
(b) Draw influence line diagram for reaction at A in the continuous beam shown. 12
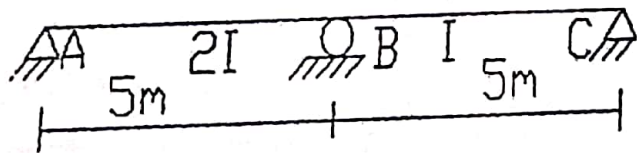
5(a) Find the vertical reaction at B using Castigliano's theorem. 6
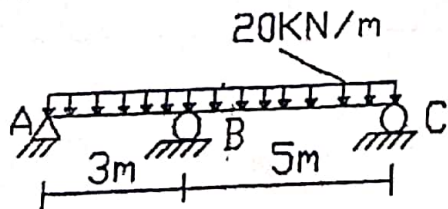
(b) Determine shape factor and plastic moment of unequal I-section shown below. Take fy=240 N/mm² 14
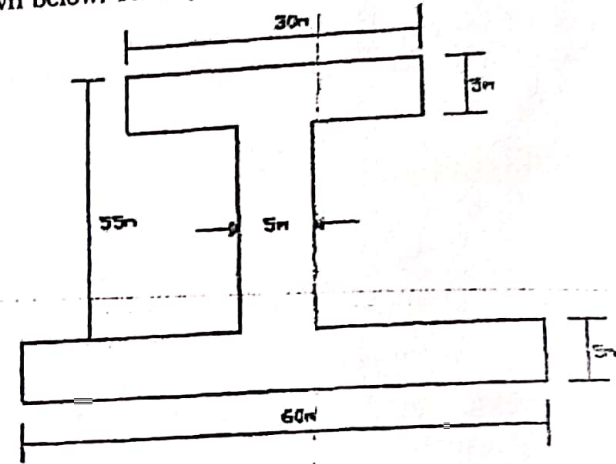
6. Analyze the frame by matrix method.

Fig6
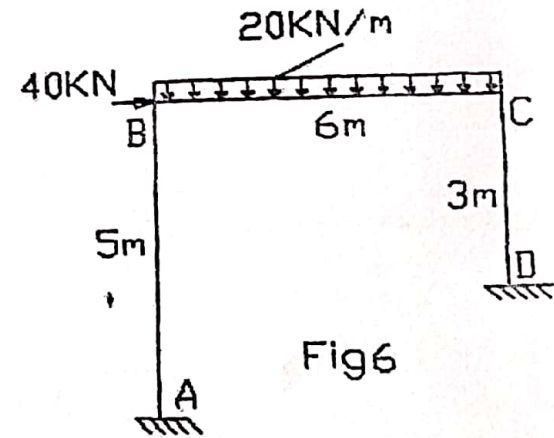
(4)

Determine the plastic moment capacity of the frame shown in figure. 12
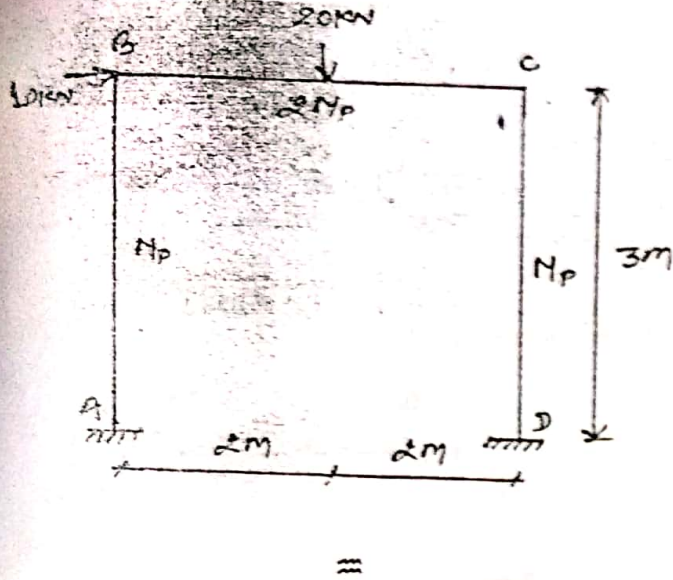
PURBANCHAL UNIVERSITY

2014

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

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

BEG354CI: Theory of Structure-II *(New Course)*

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

The figures in the margin indicate full marks.

Answer FOUR questions.   4×20=80

1(a) Determine the degree of static and kinematic in determinacy of the given rigid jointed frame if the members are inextensible. 6
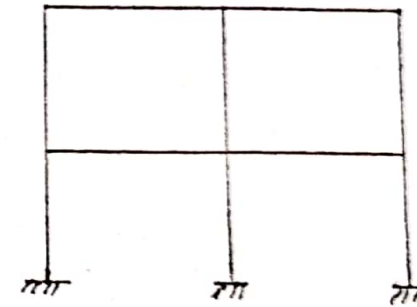
(b) Analyze the given frame using consistent deformation method. 14
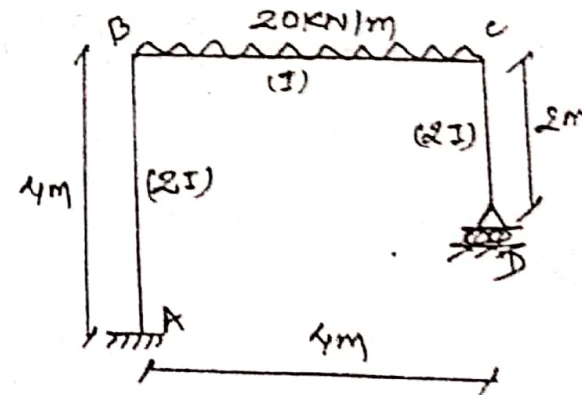
Contd. ...

2. Analyze the beam loaded by using slope deflection method if the support C sinks by 8mm. Draw bending moment diagram. $EI=2\times10^4 KNm^2$.

20
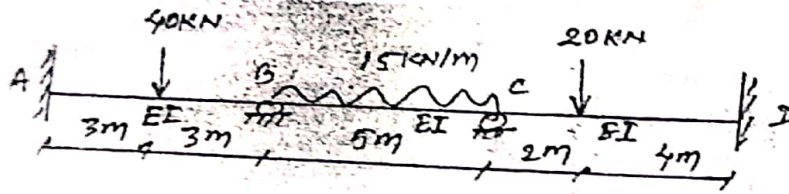
3. Analyze the frame by moment distribution method and draw bending moment diagram.

20
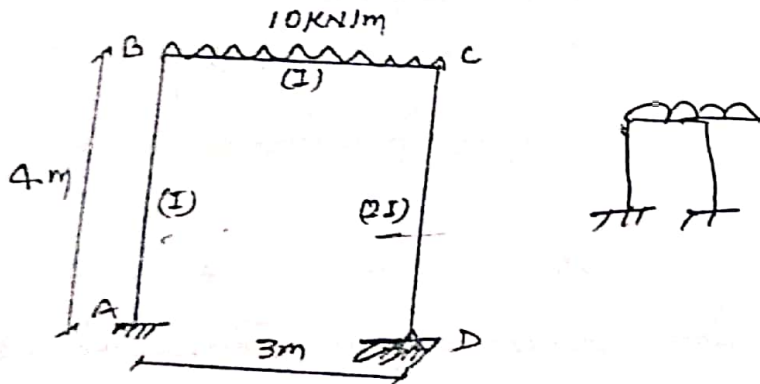
a) Find the reactions of two hinged parabolic arch loaded as shown.

10
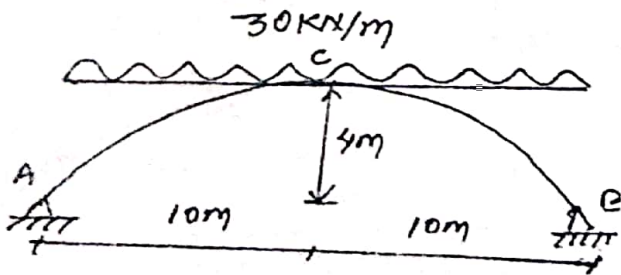
Contd. ...

(b) Draw influence line diagram for reaction at B in the beam calculating ordinates at 2m interval. Assume flexural rigidity constant throughout.
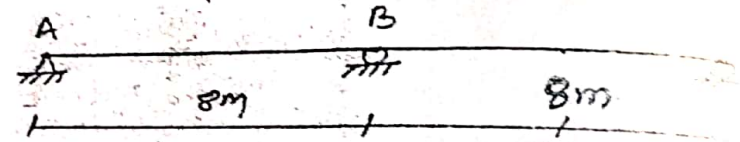
5. Analyze the frame by matrix method.
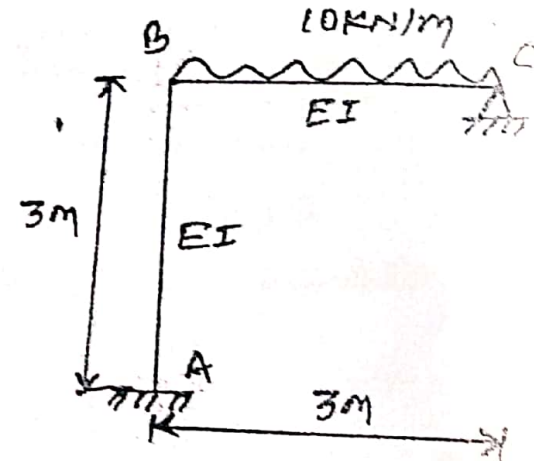
6(a) Analyze the continuous beam by the method of least work and draw bending moment diagram.
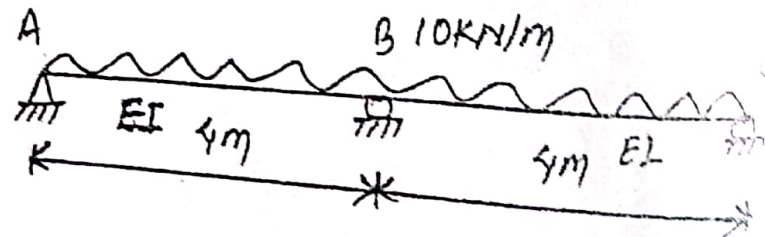
B.E. (Civil)/Fifth Semester/*Final*

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

BEG354CI: Theory of Structure-II *(New Course)*

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

The figures in the margin indicate full marks.

Answer FOUR questions.

1. Analyze the given truss using consistent deformation method and determine the actual forces in the members if member BE get rise in temperature by 20°C and member CE is 2mm short while fabrication. ———— 20
    C/S Area= 60 cm² (for all members)
    $\alpha = 10^{-7}/°C$ and E=200 kN/mm²
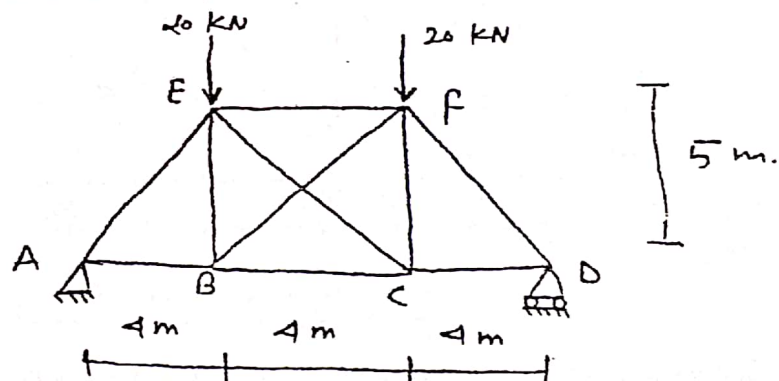
Fig. 1

2(a) Find the kinematic indeterminacy of the given frame.   4
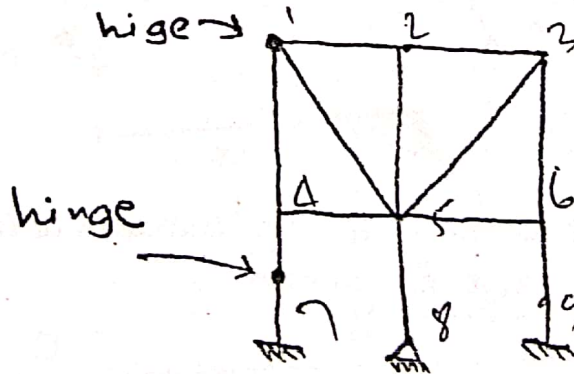
Fig. 2(a)   **Contd. ...**

(2)

Determine the moment at joints if support B Sinks by 1cm. Take ~630cm⁴ and E=2×10⁵ N/mm². Also draw bending moment diagram.
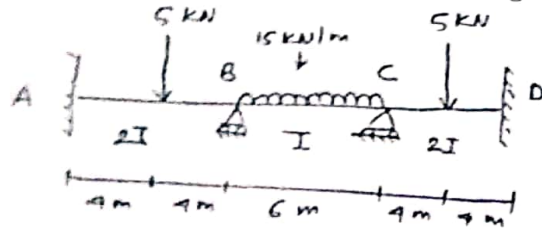
Fig. 2(b)

3. Analyze the rigid frame shown in Fig. (3) by moment distribution method.   20
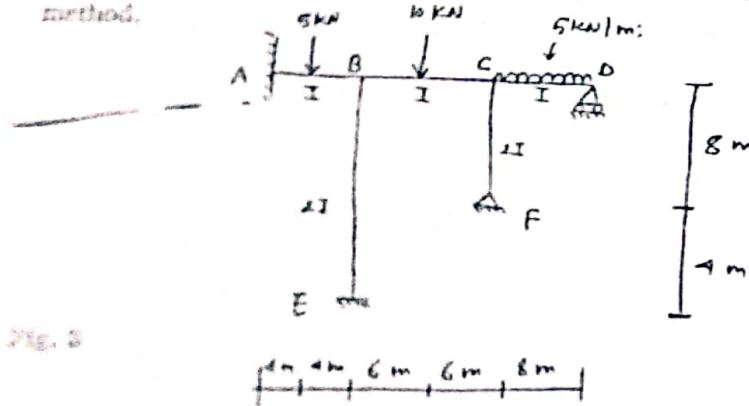
Fig. 3

4(a) Find the support reactions of two hinged parabolic arch as shown in Fig. (4).   8
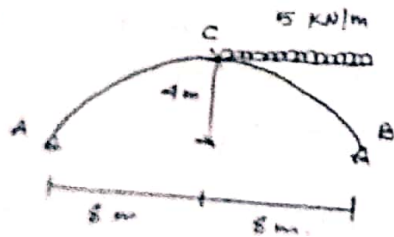
Fig. 4(a)

(b) Compute and plot ILD for moment at mid span of BC at interval of 1m. Assume constant flexural rigidity.   12
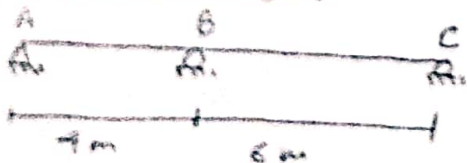
Fig. 4(b)

(3)

5(a) Analyze the frame by stiffness matrix method. EI is const
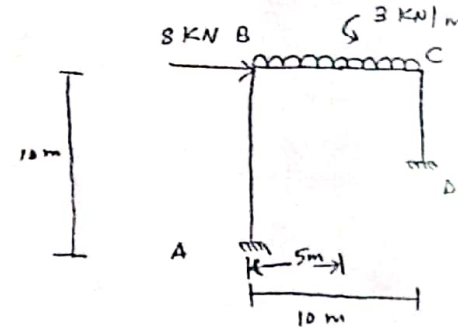
Fig. 5(a)

(b) Find internal, external and total degree of indeterminac truss.
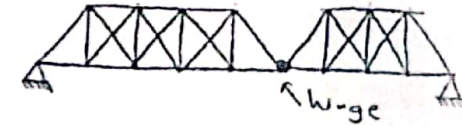
Fig. 5(b)

6(a) Find the support reactions using Castigliano's theorem.
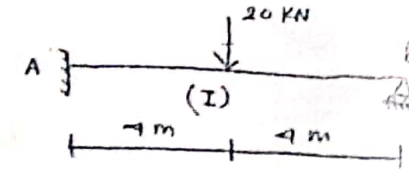
Fig. 6(a)

(b) Determine the plastic capacity of the section requir frame as shown in Fig. 6(b). The loads are working lo load factor (λ)=1.5. Assume same plastic capacity member.
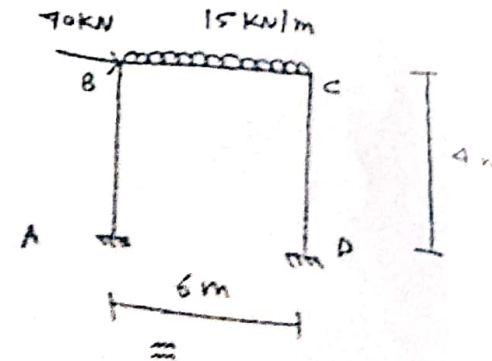
Fig. 6(b)

Contd. ...

PURBANCHAL UNIVERSITY
2012.

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

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

BEG357CI: Theory of Structure-II

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

The figures in the margin indicate full marks.

Answer FOUR questions.

1. Compute the bar forces in the bottom bars if these bars (AF, FG, GH, HE) are subjected to an increase of temperature by 25°C. Assume no change in temperature of other bars. Take $\alpha = 1/150000$ per degree centigrade and cross sectional areas of all members as 500 mm². 20
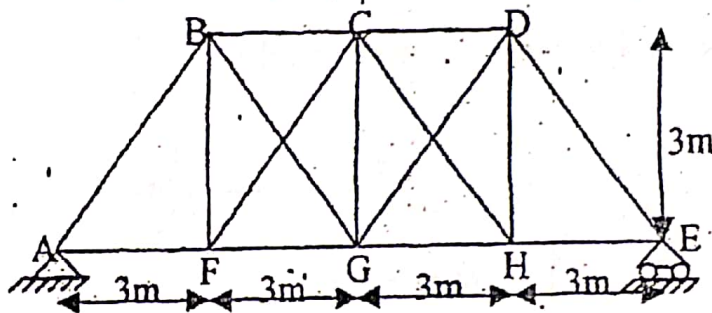
Fig. 1

2(a) What are static and kinematic indeterminacy and how can they be determined? 6

 (b) Determine moment at joints if support B sinks by 1cm. Take $I = 800 cm^4$ and $E = 2*10^5 N/mm^2$. Also draw bending moment diagram. 14
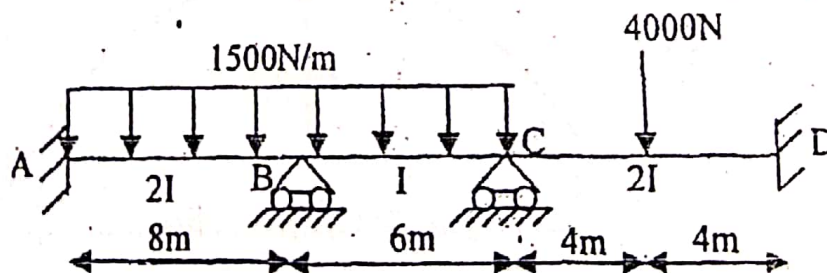
Fig. 2(b)

Contd. ...

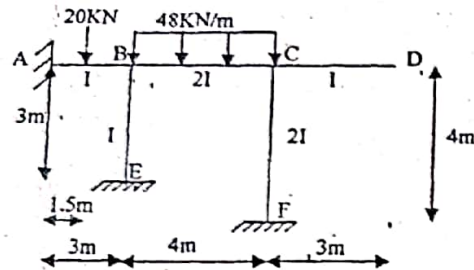3. Analyse frame by moment distribution method and draw bending moment diagram. **20**

Fig. 3

4(a) Find out moments at supports of a fixed beam due to point load acting at a distance 'a' from left hand and distance 'b' from right hand support. **6**

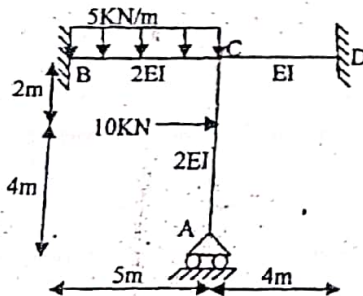(b) Analyse the frame by matrix method. **14**

Fig. 4(b)

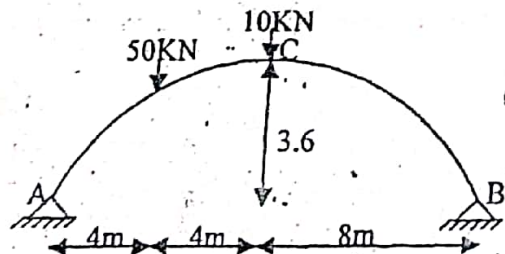5(a) Find the reactions of two hinged parabolic arch loaded as shown. **8**

Fig. 5(a)

(b) Draw influence line diagram for reaction at A in the continuous beam shown. **12**
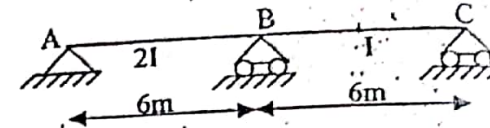

Fig. 5(b)

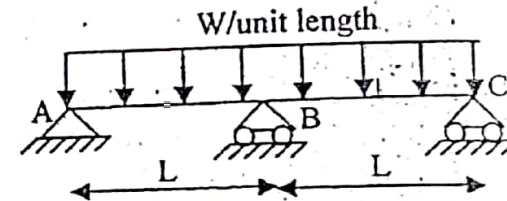6(a) Find the vertical reaction at B using Castigliano's theorem. **6**

Fig. 6(a)

(b) Calculate the plastic moment capacity required for the continuous beam with working loads as shown. Take load factor 1.5. **14**
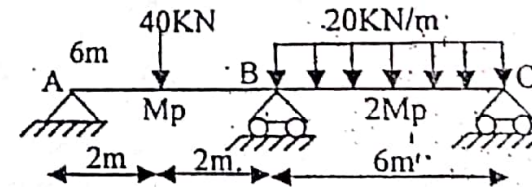

Fig. 6(b)