Duration: 3hrs **[Max Marks:80]**

Instructions:

(1) Question No 1 is **Compulsory**.
(2) Attempt any **three** questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.
(5) IRC 6, IRC 112 and use of relevant codes require for design are permitted

1 Attempt any **FOUR**

a What is difference between a fixed and an expansion type bearing? Explain the functioning of one bearing of each type with neat sketches. **05M**

b Write a note on IRC- Class A loading. **05M**

c What are different types of bridges "on the basis of nature of traffic, loading, number of lanes, position of carriage way and load transfer mechanism?" **05M**

d Write a note on Box Girder Bridge. **05M**

e Write a note on different rehabilitation techniques use in bridges. **05M**

2 a Determine dead load bending moments and live load bending moments of reinforced concrete slab culvert for a national highway having two lane carriage way (7.5m wide). The clear span is 6m, 1m foot paths on either side, width of bearing is 400mm, wearing coat is 80mm. Use M25 grade concrete and Fe-415 grade HYSD bars. Consider IRC Class AA tracked vehicle for live load. **10M**

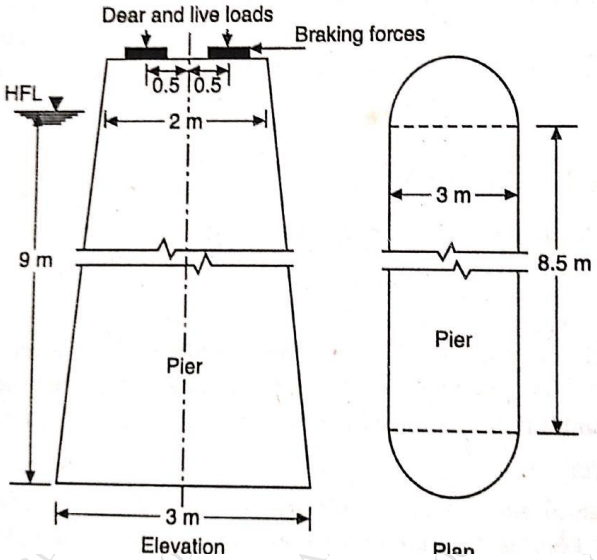
b What are various methods of launching of girders? Explain any one in detail. **05M**

c What are the different types of foundations used in bridges? How different factors influence type of foundation? **05M**

3 a Design a post tensioned prestressed concrete slab bridge deck for a National highway crossing with clear span of 10m, width of bearing is 400mm, clear width of roadway is 7.5m, 1m foot path on either side, kerbs are 600mm wide, thickness of wearing coat is 80mm. Consider IRC Class AA tracked vehicle for live load. Class 1 type structure. Use M40 grade concrete and 7mm diameter high tensile wires with an ultimate tensile strength of 1500 N/mm^2 housed in cables with 12 wires and anchored by freyssinst anchorages of 150mm diameter. For supplementary reinforcement, adopt Fe-415 grade HYSD bars. Compressive strength at transfer f_{ci} is 35 N/mm^2 Loss ratio is 0.8. **20M**

4 a Estimate the maximum and minimum stresses developed at the base of pier due to the critical combinations of the various loads. Dead loads from each span is 3000 kN, reaction due to live load on one span is1500 kN, breaking force is140 kN, wind pressure on pier is2.4 kN-m^2, 1:3:6 cement concrete use for pier **15M**

Calculate the stress developed at the base of the pier due to dead load and self-weight of pier, effect of buoyancy, due to eccentricity of live load, due to longitudinal braking forces, due to wind pressure



b Explain different types of bearing use in bridges. **05M**

5 a Design a steel rocker bearing for transmitting a vertical reaction of 1000 kN and horizontal reaction of 100 kN at the support of a bridge girder, assuming the following permissible stresses according to IRC:83-1982 **15M**
Permissible compressive stress in concrete bed block = 4 N/mm^2
Permissible bending stress in steel plate = 160 N/mm^2
Permissible bending stress in steel plate = 185 N/mm^2
Permissible shear stress in steel = 105 N/mm^2
Sketch the typical details of the rocker bearing.

b What is the provision to account dynamic effect of imposed load for roadway bridges? How different factors influence on it? Calculate impact factor for the following cases. **05M**

1. A PSC deck slab bridge of span 14m is to be designed to carry IRC Class-A vehicle.
2. A PSC longitudinal girder for a bridge of span 30m is to be designed to carry IRC Class-70R tracked vehicle.

6 a Enlist the loads acting on substructure **05M**

b Write a note on different types of expansion joints use in bridges **05M**

c Define: Bridge, culvert, foot bridge, High level bridge, submersible bridge, deck bridge, through bridge, semi through bridge. **05M**

d Explain the different methods of inspection of bridge. **05M**

****

Time: Hours **Marks: 80**

1. Question one is compulsory
2. Attempt any three from Q.2 to Q.6

Q.1 Attempt any Five out of Six [20]

a) Outline the functions of Human Resource Management.
b) Describe selection process?
c) State the application of HRD in various industries.
d) Write a note on managing processes & transformation in HR
e) What is human resource planning.
f) Write a note on Organizational behavior.

Q.2

a) What are industrial disputes? Explain the causes for industrial disputes and the ways of resolving them. [10]
b) Explain the principle and techniques of employee compensation. [10]

Q.3

a) Describe the concept Leadership styles [10]
b) Explain Theories of Motivation and their Applications for Behavioral Change. [10]

Q.4

a) Explain Traditional & modern methods of Performance Appraisal Systems. [10]
b) Explain Need, purpose, objective and role of information system in HR. [10]

Q.5

a) Describe the latest trends in human resource management. [10]
b) Describe the Role of Strategic HRM in the modern business world [10]

Q.6

a) Discuss the effect of perception on Individual Decision making, Attitude and Behavior. [10]
b) Write a note on Cross Cultural Leadership. [10]

****

Time: 4Hours **Max. Marks 80**

N.B. i. Attempt any **four** questions out of total six questions.

ii. **Illustrate** your answers/ design steps with **neat component sketches** wherever necessary though not specifically.

iii. **Assume** any other data needed **suitably**, if not given. However, **justify** the same.

iv. **Use** of IS: 456-2000 and IS: 4995-1968 **is permitted**.

1. A R.C. slab of plan dimensions 6 × 4 m is simply supported on all the edges. The intensity of live load is given to be 4 kN/m^2 and that of floor finishes, 0.8 kN/m^2. The main reinforcement to be provided in longer direction is 60% of that in the shorter direction. Analyze the slab using yield line theory and design the same using Whitney's approach. An overall load factor of 1.5 may be assumed. The materials comprise the concrete of M-25 grade and steel of grade Fe 415. **20**

   Further, if the above slab is continuous in all the directions and amount of top steel provided over the support is such that the moment of resistance is equal to 60% of the moment of resistance at mid span in each direction, determine the area of steel at mid span and supports in two directions. Draw the neat sketch.

2. A hall of 10 m × 50 m is to be covered with R.C.C. slab supported on a rectangular portal frames at 5 m c/c. The clear height of the hall is 4.2 m from the floor level. The plinth height is 0.8 m and the firm soil is available at 1.5 m below the ground level. The structure is single storeyed. **20**

   Design an intermediate portal frame. The live load may be assumed to be 4.5 kN/m^2 and the floor finishes, 2 kN/m^2. Use concrete of M-25 grade and TOR steel. Use Limit State Method. Draw neat sketches showing details of reinforcement in portal frame.

3. (a) Explain the difference between the bunkers and silos in the systematic manner w.r.t. various points. **03**

   (b) Design the bunker to store 300 kN of wheat for the following data: **17**

   - Unit weight of wheat: 7850 /m^3;
   - Angle of repose:30°
   - The stored wheat is to be surcharged at its angle of repose.

Use M-20 concrete and HYSD steel of grade Fe 415.
Design either square or circular bunker. Draw the neat sketch showing details of the reinforcement.

4. (a) A R.C. column, 350 mm × 350 mm carrying a load of 500 kN is supported on three piles, 350 mm × 350 mm in section. The centre to centre distance between the piles is 1.5 m. Design the pile cap. Use M-25 concrete and HYSD steel of grade Fe 415. **10**

(b) A curved beam AB of uniform cross section is horizontal in plan and in the form of a quadrant of a circle of radius R. The beam is fixed at A and free at B. It carries a uniformly distributed load of w per unit run over the entire length of the beam. Calculate the shear force, bending moment and twisting moment values at A and B. **10**

5. (a) Design an interior panel of a flat slab of size 5m × 5m without providing drop and column head. Size of column if 500 × 500 mm and live load on the panel is 4 kN/m^2. Take floor finishing load as 1 kN/m^2. Use M20 concrete and Fe 415 steel. Draw reinforcement details. **10**

(b) Design a corbel to carry an ultimate load of 650 kN at a distance of 260 mm from the face of a column of size 400 mm × 400 mm. The concrete grade M-25 and HYSD steel of grade Fe 415 are to be used. Draw the reinforcement details. Take bearing stress of concrete as 0.8fy. **10**

6. Attempt any **<u>two</u>** of the following:

(a) Deign a typical interior span of a continuous deep beam using the following data: **10**
Span of beam = 9.0 m, Overall depth = 4.5 m, width of supports = 0.9 m, width of beam = 0.4 m, uniformly distributed load = 200 kN/m (including self-weight), Use M20 concrete and Fe 415 Tor steel. Sketch the reinforcement details.

(b) i Draw possible yield line pattern for the following configuration of the slab: **5**

- Rectangular slab continuous over two adjacent edges and supported over a column at a junction of the adjacent edges on the opposite side.
- Equilateral triangle with two sides simply supported and one fixed.

ii Explain the difference between plate action and slab action with respect to the analysis of folded plates. **5**

(c) A folded plate with two folds AB and BC is subjected to moments in the plane of the plates. Making use of the following data, calculate the stress in the folded plates. **10**

i. Thickness of plate: 110 mm
ii. Depth of plates: $h_1 = h_2 = 2000$ mm
iii. Moment in plates: $m_1 = m_2 = 300$ kN-m

****

Duration: 3 hrs **[Max Marks : 80]**

Instructions:

(1) Question No 1 is **Compulsory**.
(2) Attempt any **three** questions out of the remaining five.
(3) All questions carry equal marks.
(4) Use of IS 1893(Part -1)- 2016 is permitted.
(5) Assume suitable data, if required and state it clearly.

1 Attempt **any FOUR**

a Write a short note on origin of earthquakes. **05M**

b Write a short note on estimation of PGA. **05M**

c Explain the measurement of earthquake by accelerograph. Define accelerogram. **05M**

d Discuss the influence of architectural aspects on the seismic response of a building **05M**

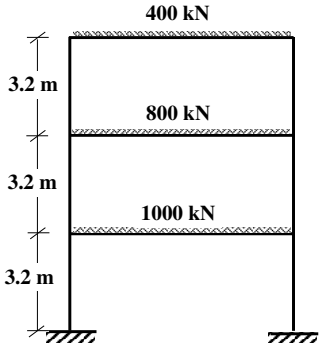
e Explain capacity design concepts. **05M**

2 a Define the following- i. Magnitude of earthquake **10M**
ii. Intensity of earthquake.
iii. Epicentre distance
iv. Isoseismals
v. Faults

b Explain ground motion and their characteristics. **10M**

3 A hospital building located in Delhi is designed as a special moment resisting frame (without infill panels). Hard soil strata is available at site. The dynamic properties for vibration based on free vibration analysis are given in the table below. Calculate the design seismic forces using dynamic analysis. Show the distribution of lateral forces along the height of the building. **20M**

Modes	Natural period(sec)	Roof	2nd floor	1st floor
Mode 1	15.61	1.00	0.800	0.440
Mode 2	10.80	1.00	-0.560	-1.250
Mode 3	3.85	1.00	-2.250	1.800

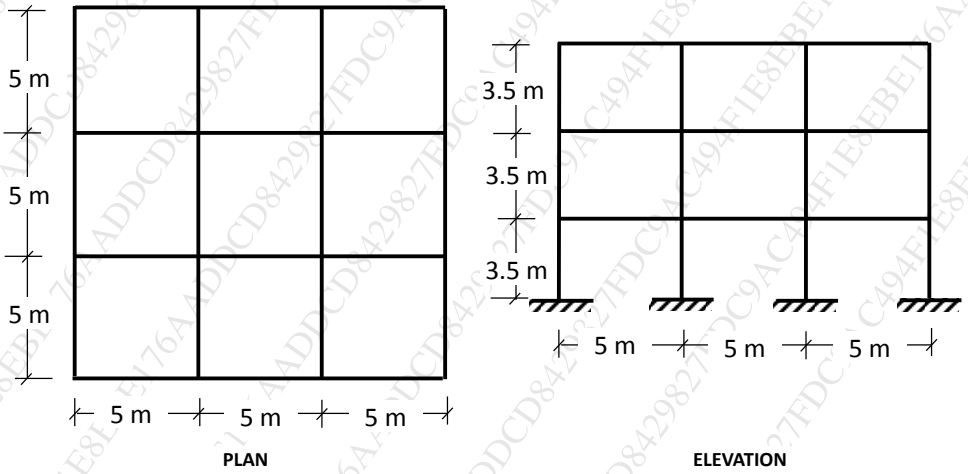


4 a List out and discuss the four virtues of good earthquake resistant design **10M**

b What are the reinforcement requirements in columns as per provisions of IS 13920-2016 **05M**

c Write a short note on performance-based design in earthquake engineering. **05M**

5 a Calculate the base shear for an RC building located in Pune. The building is having plan dimensions 15m x 15m as shown in figure. The soil conditions are medium stiff. The special moment resisting RC frames are infilled with brick masonry. The lumped weight due to dead loads is 12 kN/m^2 on floors and 10kN/m^2 on the roof. The floors are to cater for a live load of 4 kN/m^2 and 1.5kN/m^2 on the roof. Floor to floor height is 3.5m. Also show distribution of shear along the height of building. **15M**



b Explain the types of faults with diagrams. **05M**

6 a Explain with diagrams propagation of earthquake waves. **05M**

b Write a short note on Indian earthquakes. **05M**

c Explain the design philosophy for earthquake resistant structures. **05M**

d What is earthquake design spectrum and inelastic spectra? **05M**

Time: 3 hour **Max. Marks: 80**

Notes :

1. Question No **ONE** is **Compulsory**.
2. Answer any **THREE** from the remaining.
3. Draw **FIGURES** wherever necessary. The figures to the right indicate full marks.
4. **WRITE** proper question/sub-question numbers on the left margin allotted in the answer sheet.
5. Each Question carries **EQUAL** marks.
6. **ASSUME** any additional data if necessary and state it clearly.

Q.No.1 Solve any FOUR Questions out of SIX 5 marks each

a Explain the Pascal Triangle for two dimensional element

b What do you understand by Geometric Nonlinearity and Material Nonlinearity?

c Explain the terms C^0 ,C^1& C^2 type continuity

d Discuss the various points to be considered while descretizing a structure for finite element analysis

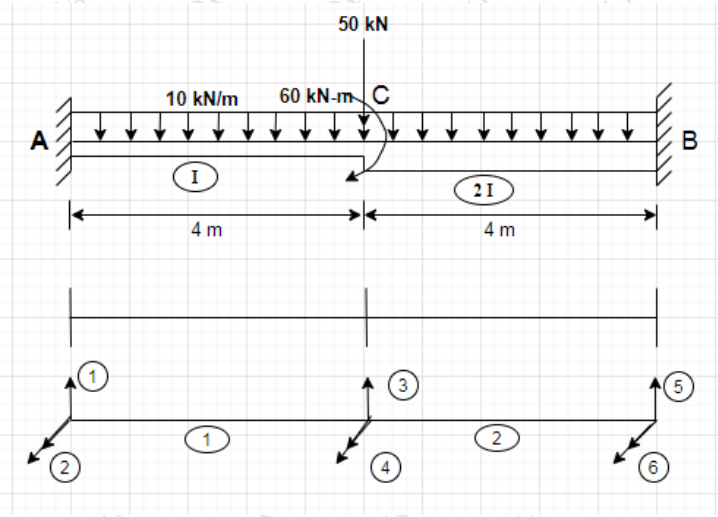
e Explain plane stress and plane strain problem

f Write step by step procedure of finite element method

Q.No.2 Solve any one out of two of 20 marks each

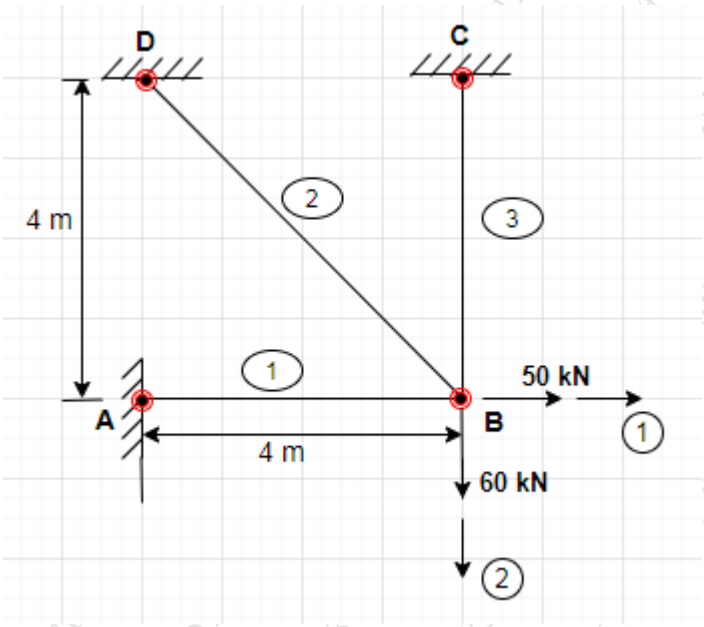
A

Analyse the structure as shown in fig by using Finite Element Method ,draw shear force ,Bending Moment and elastic curve



B

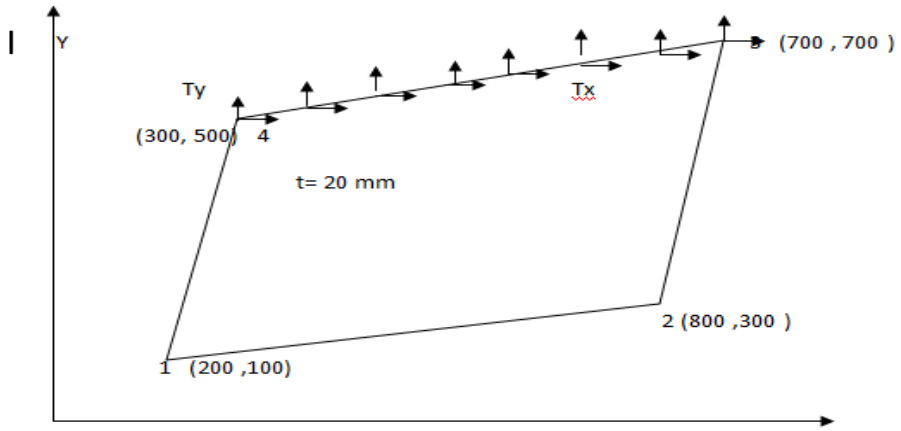
Analyse the pin jointed plane frame by finite element method, determine the nodal displacement and stress in each member. Find the support reactions E = 2 x 10^5 N/mm^2 ,Cross sectional area of all member is 20000 mm^2



Q.No.3.

A

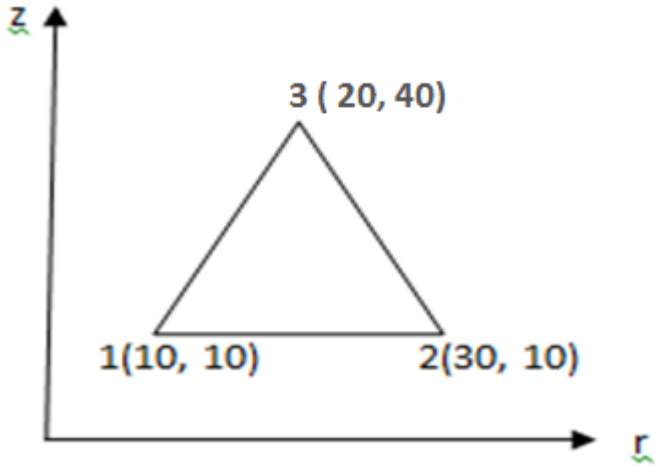
The quadrilateral element shown in fig is 20mm thick and is subjected to surface forces Tx and Ty. Determine expression for its equivalent nodal forces. If Tx= 20 N /mm^2 and Ty= 25 N/mm^2, determine the numerical values of the nodal forces. (10)



B Using polynominal functions (generalized coordinates) determine shape function for a two noded beam element. (10)

Q.No.4.

a) Calculate the stiffness matrix for the element (LST) shown in figure? Co-ordinates are given in mm. Assume plane stress conditions. Take E=2.1X10^5 N/mm^2, υ=0.25, t=20mm. Co-ordinate are in millimeter (16)



b) Convergence and compatibility requirement of a finite element (4)

Q.No.5 a) A uniform fixed beam is molded by two element, each of length ' L/2' Determine natural frequency of vibration in the first mode considering Consistent mass matrix. (10)

b) Determine the value of following integral using 2 x 2 and 3 x 3 Gauss quadrala rule

$I = \int_{-1}^{1}\int_{-1}^{1}(0.75 (s-1)^2 + 2.25 (t-1)^2)\, ds\, dt$ (10)

Q.No. 6 a)Determine the critical load for a prismatic column fixed at both ends (10)

b) Starting with shape function relationship derive Consistent Mass matrix for a 2-noded beam element. (10)

****

Time: 3 Hours **Total Marks : 80**

N.B. (1) Question No. 1 is Compulsory.
(2) Solve any three questions out of remaining Five questions.
(3) Figures to right indicate full marks.
(4) Assume suitable data if needed but justify the same.

Q.1 Attempt any four of the following

(a) State the assumptions in the small deflection theory of thin plate. **5**

(b) State the difference between Navier's and Levy's method. **5**

(c) Explain advantages and disadvantages of shell. **5**

(d) Explain membrane theory of shell. **5**

(e) Sketch the free body diagram of a plate element representing lateral loads, moments and shears. **5**

Q.2 (a) Derive the expression for moment in any direction in a slightly bent plate. **10**

(b) Explain the stepwise procedure in Navier's method for bending analysis of a thin rectangular plate simply supported at all four edges. **10**

Q.3 (a) Using Navier's method, find out maximum deflection & maximum B.M. for a square plate of side 3m, thickness 0.12m under uniform load of 3 KN/m^2 .Take E = 210 GPa & $\mu = 0.1$.. **08**

(b) Derive governing differential equation for circular plate under axisymmetric loading. **12**

Q.4 (a) A simply supported circular plate of diameter 350mm is subjected to UDL of 120 KN/m^2. Find the thickness of the plate if maximum deflection is limited to 2.7mm. Also find the maximum moments and bending stresses. Take $\mu = 0.3$ and E= 69GPa. **10**

(b) Explain the meaning and give example of the following **10**

i) Ruled Surface
ii) Singly Curved Surface
iii) Doubly Curved Surface
iv) Surface Revolution
v) Surface Translation

Q.5 (a) Derive the expression for meridional and circumferential forces for a hemispherical dome subjected to self-weight alone. Also draw variation showing compression and tension. **15**

(b) Why bending theory is essential in cylindrical shell. **05**

Q.6 (a) Derive Schorer form of differential equation for cylindrical shell. **15**

(b) Explain classification of plates. **05**

****

[Time: 3 Hrs] **[Marks:80]**

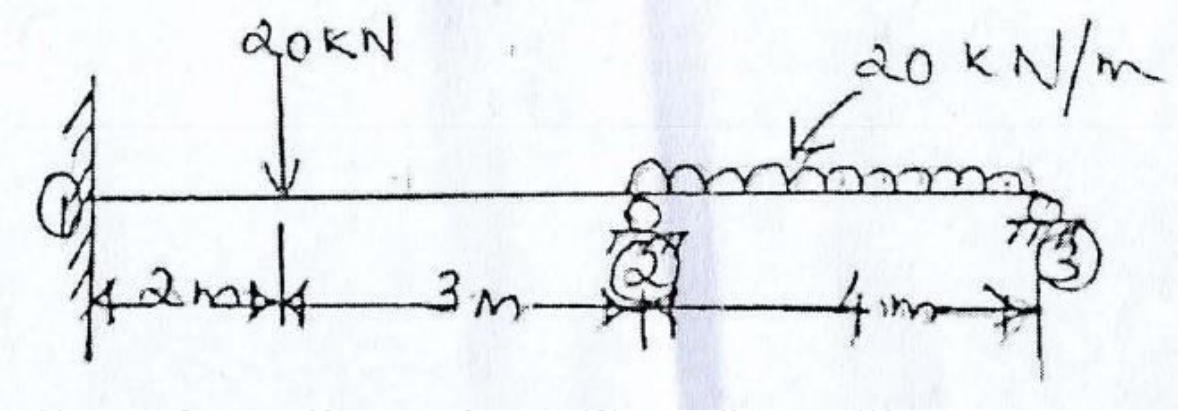
Please check whether you have got the right question paper.

N.B: 1. Question No:1 is compulsory
2. Attempt any three questions from the remaining five question
3. Figures to the right indicates full marks
4. Assume any suitable data if required.

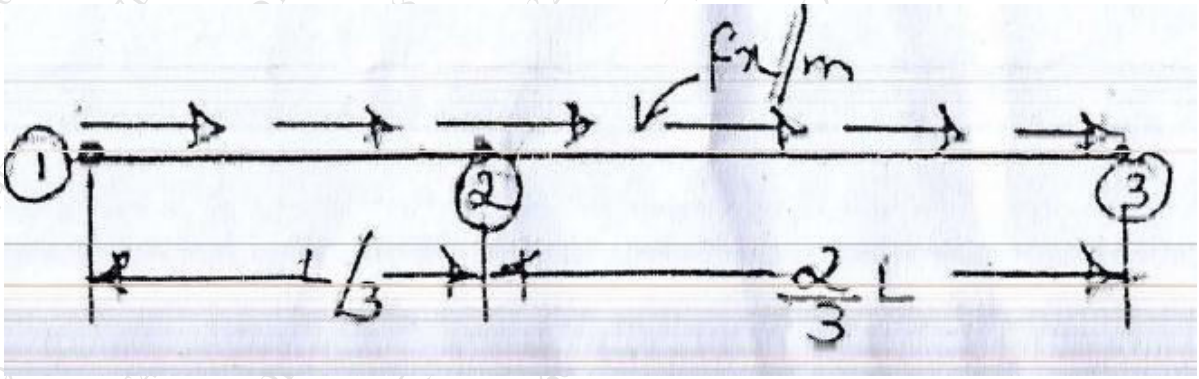
1. Write short notes on any four **20**

a) Convergence and compatibility requirement of a Finite Element
b) Use of Pascal's triangle in FEM
c) Difference amongst: Eigen Value problem, initial value problem. boundary value problem
d) Explain C^0, C^1, C^2 TYPE continuity of problems
e) Use of Jacobian Matrix in FEM

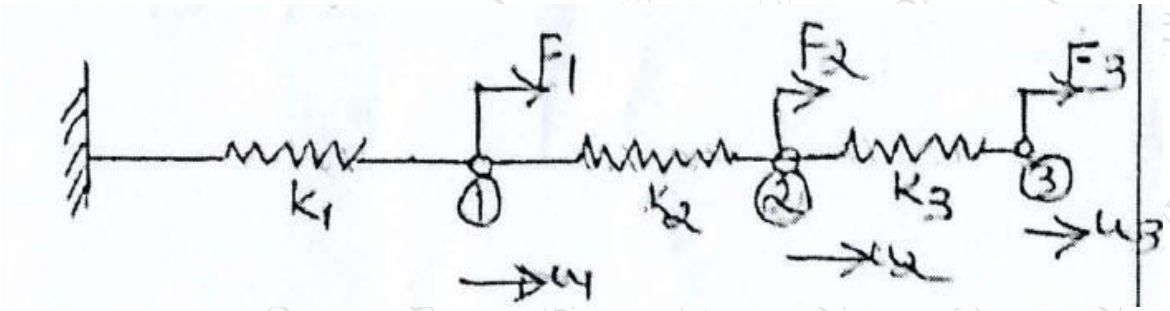
2. Determine the unknown DOF & Support Reaction. Also draw SFD and BMD for the beam shown in Figure below. **20**



3. a) Determine the equivalent nodal loads due to udl of magnitude fx/unit length as shown in figure **10**



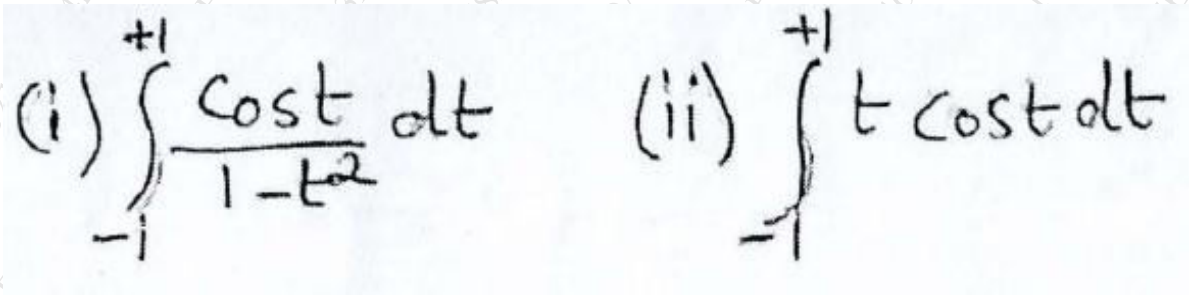
b) Assemble the equation of equilibrium for a spring system as shown as shown in Figure by direct approach. Show that minimization of Potential of Potential Energy also yields the same result (stiffness method)



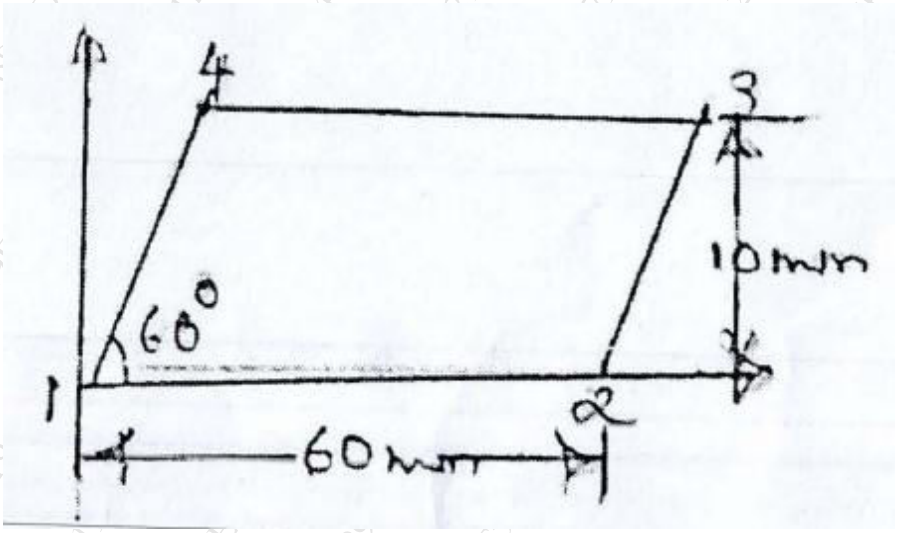
4. a) Using Polynomial functions, determine the shape function of a Constant State Triangle **10**

b) Starting with Strain displacement relationship, derive the gomeric stiffness matrix for a 2 noded beam clement **10**

5a) Determine the value of the following integral using Guassin quadrature using 2x2 and 3x3 Guass points **10**

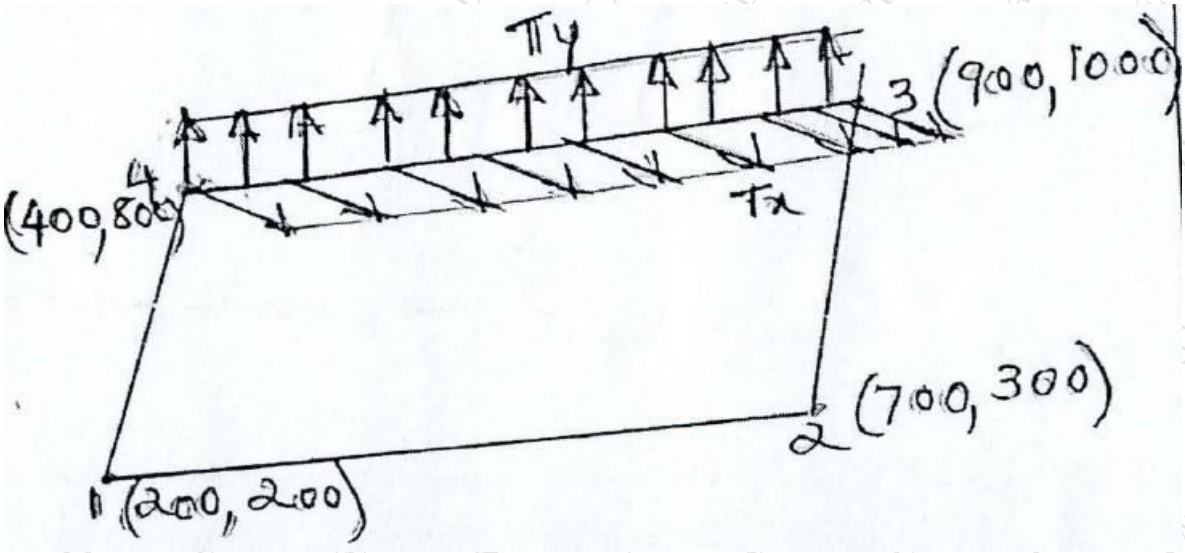


b) Assemble Jacobian Matrix and strain displacement matrix corresponding to Guass point (0.57735, 0.57735) for the c1emcnt shown in Figure. Also, show how clemcnt stiffness matrix is assembled **10**



6a) Using Lagrange functions, derive shape functions for hexahedron (brick) clement **10**

b) The quadrilateral shown in Figure is 30mm thick and is subjected to surface force Tx and ty, Determine expressions for its equivalent nodal forces Tx=60 N/mm^2 and ty=70 N/ mm^2. Determine the numerical value of the nodal forces.



****