ANALYSIS OF STRUCTURES II
(CIVL 3101)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

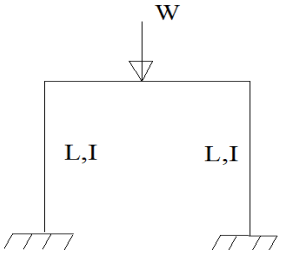
(i) A propped cantilever beam AB of span L is subjected to a moment M at the prop end B. The moment at fixed end A is

(a) 2M (b) M/2 (c) M (d) 3M/4

(ii) A suspension bridge with two hinged stiffening girder is statically

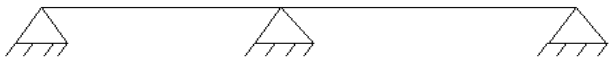
(a) Determinate (b) Indeterminate to 1 degree
(c) Indeterminate to 2 degree (d) Indeterminate to 3 degree.

(iii) The portal frame shown below will



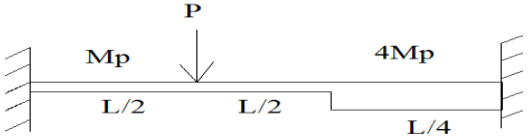
(a) No sway (b) Sway towards left
(c) Sway towards right (d) Sway either to left or right.

(iv) The degree of kinematic indeterminacy of the beam shown below



(a) 2 (b) 3 (c) 4 (d) 5.

(v) For the beam shown in fig the collapse load P is given by



(a) $16M_p/L$ (b) $14M_p/L$ (c) $12M_p/L$ (d) $10M_p/L$

(vi) Building frames subjected to vertical loads can be approximately analysed with the assumption that:
(a) Inflection point will occur at 0.25 L from two ends of girder.
(b) Inflection point will occur at 0.1 L from two ends of girder.
(c) Inflection point will occur at 0.3 L from two ends of girder.
(d) Inflection point will occur at 0.15 L from two ends of girder.

(vii) In cantilever method, the basic deformation in the frame is:
(a) Torsion with shear (b) Torsion along with bending
(c) Bending and not shear (d) Only in shear.

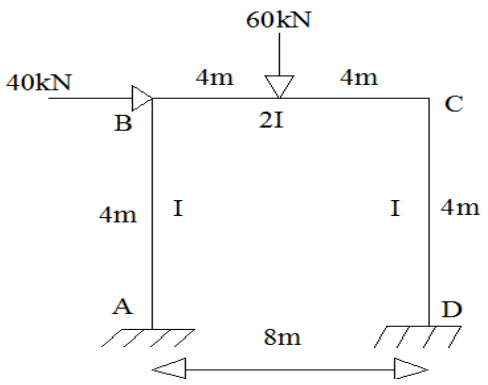
(viii) At the shear centre of any symmetric or unsymmetric section:
(a) Bending and Twisting both occurs
(b) Twisting is absent but bending occurs
(c) Twisting occurs but bending is absent
(d) None of the above.

(ix) In Portal method, the shear resisted by an exterior column of any storey is equal to, (where n=number of bays in any storey):
(a) (1/2n) of the total storey shear (b) (1/n) of the total storey shear
(c) (1/4n) of the total storey shear (d) (1/3n) of the total storey shear.

(x) For stable structures, one of the most important properties of flexibility and stiffness matrices is that elements on the main diagonal:
(a) of a stiffness matrix must be positive and that of flexibility matrix must be negative
(b) of a stiffness matrix must be negative and that of flexibility matrix must be positive
(c) of both stiffness and flexibility matrices must be negative
(d) of both stiffness and flexibility matrices must be positive .

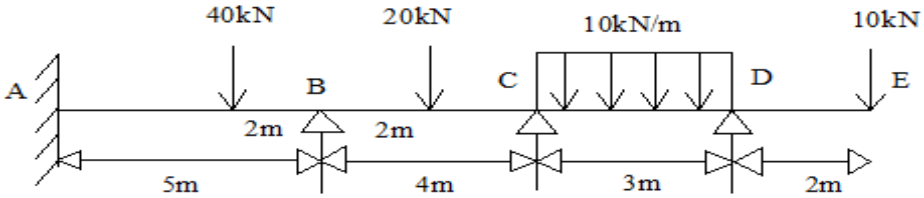
Group – B

2. Analyze the portal frame shown in fig given below by slope deflection method: [(CO1)(Evaluate)/HOCQ]



12

3. (a) Analyse the continuous beam shown in fig. by moment distribution method and draw bending moment diagram. Assume *EI* constant throughout. [(CO1) (Evaluate)/HOCQ]

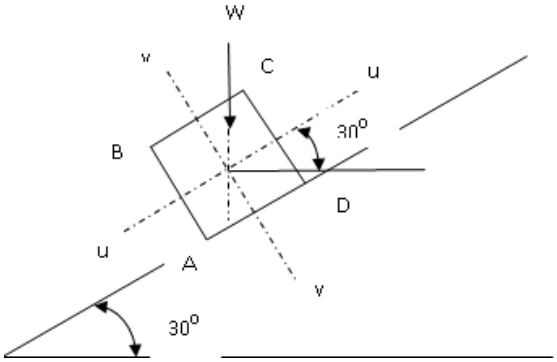


(b) The two hinged stiffening girder of a suspension bridge have a span of 100m, the dip of the supporting cable being 10m. If the girder is subjected to two point loads 200kN and 400kN at a distance of 20m and 80m from the left end. Find the maximum tension in the cable. [(CO2)(Evaluate)/IOCQ]

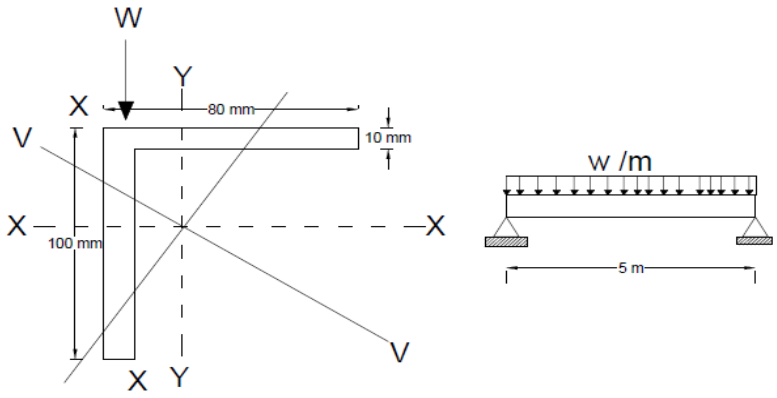
8 + 4 = 12

Group – C

4. (a) A wooden beam of cross section 120 mm x 150mm is used as shown in Fig. to support a sloping Mangalore tiled roof. It has an effective span of 6m and carries a uniformly distributed load of 5 kN/m acting vertically downward. Determine the maximum stresses developed in the beam. [(CO4)(Evaluate/ IOCQ)]

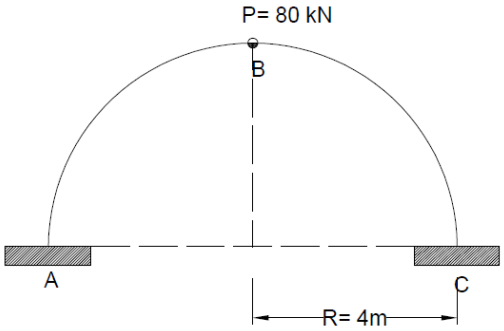


(b) An angle section 100 mm X 80 mm X 10 mm is used as a beam over a span of 5 m. If the permissible stress is 100 MPa, find the uniformly distributed load that the beam can carry. The load passes through the shear centre. [(CO4)(Evaluate/HOCQ)]

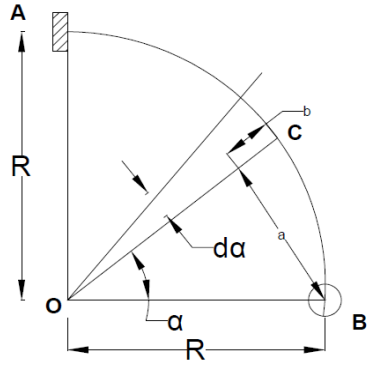


6 + 6 = 12

5. (a) Find the bending moment at midspan of a semi-circular beam loaded at the midspan with a concentrated load of 80 kN. The beam is fixed at both the supports. Find the maximum bending moment and maximum torque in the beam. [(CO3)(Evaluate/HOCQ)]



(b) A quarter circle beam of radius R curved in plan is fixed at end A and free at end B as shown below. It carries a vertical P at it's free end. Determine the deflection at the free end and sketch the shear force, bending moment and torsional moment diagrams. Assume flexural rigidity (EI) is same as the torsional rigidity (GJ). [(CO3)(Evaluate/IOCQ)]



6 + 6 = 12

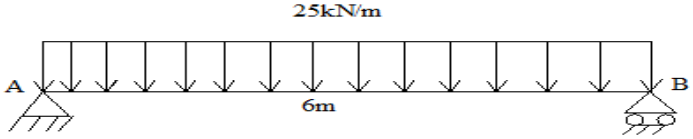
Group – D

6. (a) Find shape factor of a symmetrical I- section having respective dimensions:
(i) Top and bottom flange width = 120 mm
(ii) Top and bottom flange thickness = 10 mm
(iii) Thickness of web = 20 mm
(iv) Total depth = 200 mm. [(CO5) (Evaluate/IOCQ)]

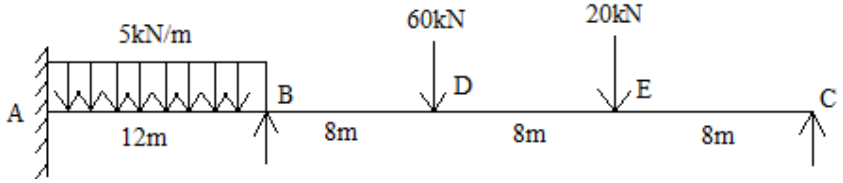
(b) Explain the formation of plastic hinge in a collapsed beam and various modes of collapse mechanisms in structures (plastic state). [(CO5)(Evaluate/LOCQ)]

6 + 6 = 12

7. (a) Determine the collapse load of a simply supported beam shown below: [(CO5)(Remember/IOCQ)]



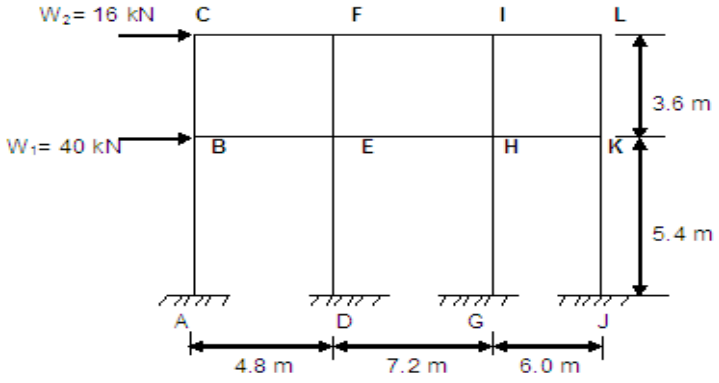
(b) A continuous beam ABC is loaded as shown in fig. Determine required M_p if the load factor is 3.5. [(CO5)(Evaluate/HOCQ)]



4 + 8 = 12

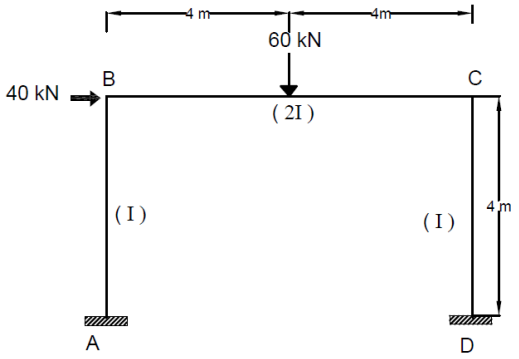
Group – E

8. (a) Analyse the building frame shown below using Portal Method. Draw separate diagrams to show S.F.D. and B.M.D of columns and beams. [(CO6)(Analyze/IOCQ)]



12

9. Analyse the continuous beam shown below using Flexibility or Stiffness Matrix Method. Also draw the final Bending Moment of this frame. [(CO6)(Evaluate/HOCQ)]



12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	7.14 %	50.0 %	42.86 %

Course Outcome (CO):

After the completion of the course students will be able to:

CO1: Apply the Slope Deflection and Moment Distribution.

CO2: Develop and analyze the concept of suspension bridge and stiffness girders.

CO3: Apply and analyze the concepts of curved beam analysis in hooks, rings and Bow girders.

CO4: Develop the concept bending in unsymmetrical bending in beams.

CO5: Develop the fundamental concepts of plastic analysis using kinematic method and apply them in frames and continuous beam analysis.

CO6: Develop and analyze the portal frames using Portal and Cantilever method. Develop and analyze the indeterminate structures (continuous beams and frames) using flexibility and stiffness matrix method.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	Submission Link
CE - BACKLOG	Google classroom joining code Ylksi7r
	Google classroom joining link https://classroom.google.com/u/0/c/NDY2NDY2MjM5OTg4
	Answer script upload link https://classroom.google.com/u/0/w/NDY2NDY2MjM5OTg4/t/all