(b) Determine the plastic moment capacity required in the portal frame shown in Fig.9. Plastic moment capacity of beam = 0.5 times the plastic moment capacity of columns.

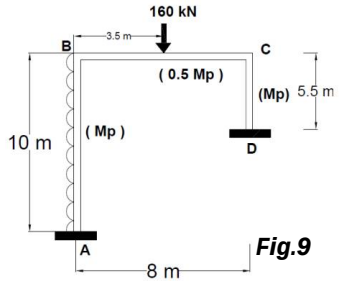

Fig.9

6 + 6 = 12

Group – E

8. For the multi storey frame shown in the Fig.10, determine all the column-end and beam-end moments due to lateral loads as shown. The storey heights are 4 m. each. Analyse the frame using Portal method. Also show a separate diagram showing the B. M. D. of all the beams and columns subjected to these lateral forces.

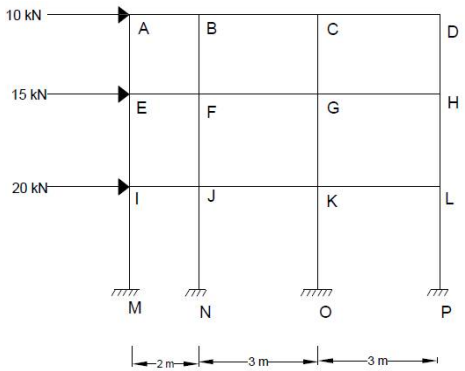

Fig.10

12

9. Analyse the continuous beam using stiffness method and also draw the B. M. D of the beam.

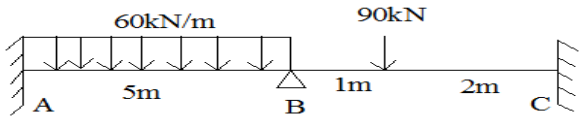

Fig.11

12

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) In moment distribution method, the sum of distribution factors of all the members meeting at any joint is always
(a) zero (b) less than 1 (c) 1 (d) greater than 1.

(ii) The carryover factor in a prismatic member whose far end is fixed is
(a) zero (b) 1/2 (c) 3/4 (d) 1.

(iii) In the slope deflection equations, the deformations are considered to be caused by
(a) bending moment (b) shear force
(c) axial force (d) shear force and axial force.

(iv) When a unit rotation is given at end A of the beam shown in Fig.1, the moment produced at end B will be

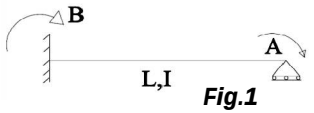

Fig.1

(a) 0 (b) 2 EI/L (c) 4 EI/ L (d) 6EI/L.

(v) If one end of a prismatic beam AB with fixed ends is given a transverse displacement Δ without any rotation, then the transverse reactions at A or B due to displacement is
(a) $6EI\Delta / L^2$ (b) $6EI\Delta / L^3$
(c) $12EI\Delta / L^2$ (d) $12EI\Delta / L^3$
where, EI is flexural rigidity and L is span of beam.

(vi) In plastic analysis, the shape factor for a circular section is
(a) 1.5 (b) 1.6 (c) 1.7 (d)1.8.

(vii) The probable number of collapse mechanisms to occur for this plastic frame shown in Fig.2

(a) 3 (b) 5
(c) 6 (d) 7.

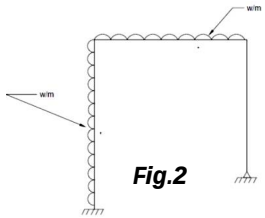

Fig.2

(viii) F For the beam shown in Fig.3 the collapse load P is given by

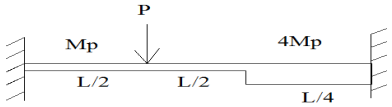

Fig.3

(a) 16 M_P/L (b) 14 M_P/L
(c) 13 M_P/L (d) 10 M_P/L.

(ix) Building frames subjected to vertical loads can be approximately analysed by
(a) Portal method (b) Cantilever method
(c) both of above methods (d) none of the above methods.

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

Group – B

2. From the Fig.4, analyse the continuous beam by the Slope-deflection method. The supports B and C settle by 9 mm and 3 mm respectively. EI = 30000kN m^2.

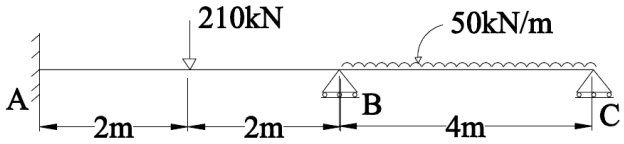

Fig.4

12

3. Find the moments at the critical sections of the frame shown in Fig.5 by moment distribution method. EI is same for all members.

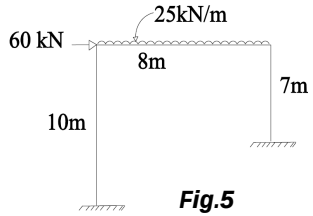

Fig.5

12

Group – C

4. A steel crane hook caries a load P = 1500 kg as shown in Fig.6. The cross section mn of the hook is trapezoidal as shown in the figure. Find the total stresses σ_m and σ_n at points m and n. The following numerical data are given: b_1 = 5 cm, b_2 = 2 cm, r_1 = 4 cm, r_2 = 12cm.

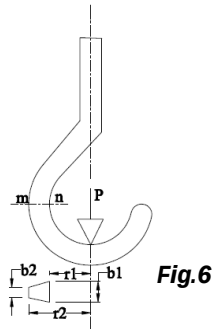

Fig.6

12

5. In unsymmetric bending derive the formula of I_u and I_v also derive $\tan 2\alpha_1 = -\frac{2I_{YZ}}{I_Z - I_y}$.

Where, I_u and I_v are moment of inertia about the principal axes, α_1 is angle of principal axes with positive Z axis.

12

Group – D

6. (a) Find the shape factor for the Fig.7 given below:

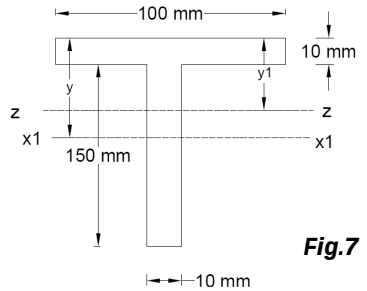

Fig.7

(b) A two span continuous beam ABC has a span of length AB = 6 m and BC = 6 m and carries an uniformly distributed load of 30 kN/m. A and C are simply supported. If the load factor is 1.8 and the shape factor is 1.15 for the I section. Find the section modulus needed.

7 + 5 = 12

7. (a) Determine the plastic moment capacity for the continuous beam shown in Fig.8. The loads provided are working loads. (Take λ_s = 1.5).

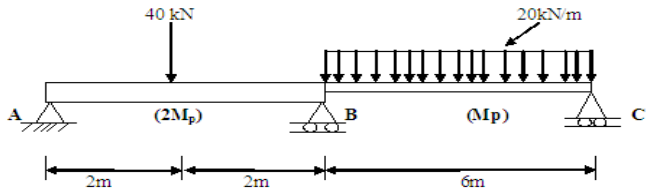

Fig.8