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CE 1817 PE 11

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31/11/22

2022

BINA C. UNIVERSITY CENTRAL LIBRARY
(B.A.T. & C.P.S.)
Ajmer, Rajasthan,
Guwahati - 781017

B.Tech. 7th End Semester Examination

CE

(Program Elective - I) — ADVANCED STRUCTURAL ANALYSIS

(New Regulation (w.e.f. 2017-18) & New Syllabus (w.e.f. 2018-19))

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No. 1 and any *four* from the rest.

1. Pick up the correct answer :

- (i) Pre-Processing in Computer Aided Structural Analysis comprises Input of (1)
- (a) Nodal Data and Member Data
 - (b) Material Data
 - (c) Geometry Data
 - (d) All of the above
- (ii) The Bar element in a Two Dimensional structural model will have (1)
- (a) 2-DOF
 - (b) 4-DOF
 - (c) 6-DOF
 - (d) None of the above
- (iii) The Element Stiffness Matrix of an element representing the stiffness of the element is derived in (1)
- (a) Global Coordinate System (GCS)
 - (b) Local Coordinate System (LCS)
 - (c) Both of (a) and (b)
 - (d) None of the above

[Turn over

- (iv) The Rotation Matrix R , element stiffness Matrix k in LCS and element stiffness Matrix K in GCS are related as (1)
- (a) $K = RK^{-1}R$ (b) $K = R^T k R$
 (c) $K = RKR^T$ (d) $K = RkR^T$
- (v) The number of simultaneous equations to be solved in the slope deflection method is equal to (1)
- (a) Static indeterminacy
 (b) Kinematic indeterminacy
 (c) Number of joint displacements in the structure
 (d) None of the above
- (vi) There is _____ stress on principal plane. (1)
- (a) Minimum bending (b) Maximum tensile
 (c) Zero shear (d) Maximum shear
- (vii) What are the causes of sway in Portal Frame? (1)
- (a) Unsymmetrical loading
 (b) Different Column end conditions
 (c) Different flexural rigidity of columns
 (d) All the above
- (viii) Shear centre is defined as (1)
- (a) The point where a shear force can act without producing any twist in the section
 (b) The point where a shear force can act with producing a twist in the section
 (c) The point where a torsional force can act without producing any shear force in the section
 (d) The point where a torsional force can act with producing a shear force in the section
- (ix) In the pin jointed truss shown in figure 1, the static degree of indeterminacy is (2)

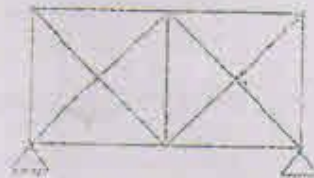


Figure 1

- (a) 1 (b) 2
 (c) 3 (d) 4

2. (a) Briefly explain how applied moment at a structural joint is distributed to various members depending on their relative stiffness. (5)
- (b) Using moment distribution method, analyze the portal frame shown in figure 2. All 10 the members have same flexural rigidity. (10)

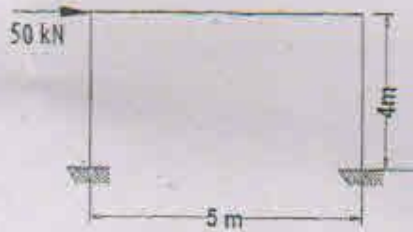


Figure 2

3. (a) Derive the Slope deflection equation for the simply supported end of a Continuous beam. (5)
- (b) The figure 3 shows a continuous beam. Find the support moments using slope deflection method. And draw the BMD. (10)



Figure 3

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4. (a) What is shear center and shear flow. (2)
- (b) Determine the product of inertia of the angle section $75 \times 75 \times 10$ mm about the centroidal axis of the section. (6)
- (c) Locate the shear Centre of the channel section shown in Figure 4. (7)

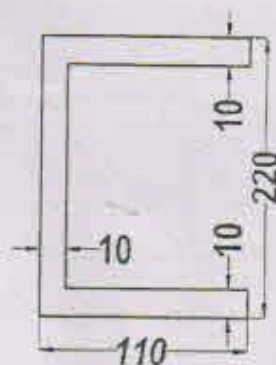


Figure 4

5. (a) Establish the Global Stiffness Matrix of the Portal frame structure given in Figure 2. (10)
- The columns are $400 \text{ mm} \times 400 \text{ mm}$.
 The beam is $250 \text{ mm} \times 450 \text{ mm}$
 The material is concrete of Grade M25
- (b) What do you understand by NODAL DATA, CONNECTIVITY DATA in Direct Stiffness Method? Briefly explain. (5)
6. (a) Write the LOAD VECTOR in the structure for Matrix Analysis, having 4 (Four) Nodes and 3 Elements as shown in the figure 5. (10)

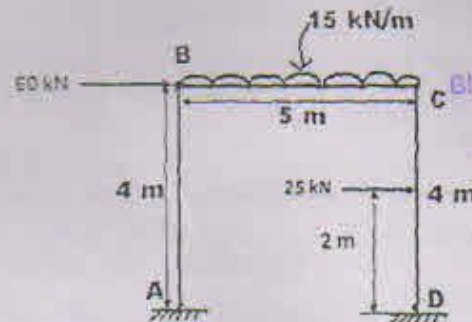


Figure 5

- (b) Describe the advantages of stiffness method. (5)
7. (a) What is the static indeterminacy and kinematic indeterminacy for the frame? (5)
- (b) Using unit load method, determine the vertical deflection of the joint F of the pin jointed truss shown in figure 6. The support A and D are hinged and roller support respectively. The area of the all the members are 150 mm^2 . Take $E = 200 \text{ kN/mm}^2$ and consider $AB = BC = CD = BE = FC = 4 \text{ meter}$. (10)

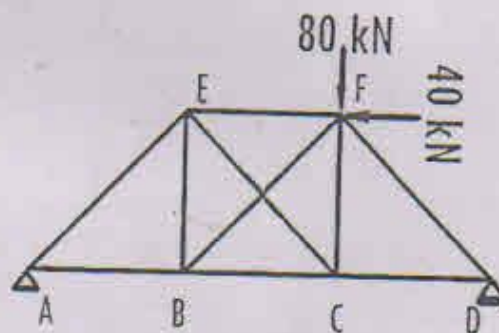


Figure 6