Total No. of printed pages = 4

CE 1817PE11

Roll No. of candidate | | | | | | | | | | |

1912/22 2021

B.Tech. 7th Semester End-Term Examination

CE

ADVANCED STRUCTURAL ANALYSIS (Program Elective – I)

(New Regulation (w.e.f. 2017-18) &
New Syllabus (w.e.f. 2008-19))

Full Marks – 70 Time – Three hours

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

Answer question No. 1 and any *six* 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 Beam element in a 2D 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

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(iv) The Rotation Matrix R , element stiffness Matrix k in LCS and element stiffness Matrix K in GCS are related as (1)

(a) $k = R\,K^{-1}\,R$

(b) $K = R^T\,k\,R$

(c) $k = R\,K\,R^T$

(d) $K = Rk\,R^T$

(v) The Rotational Stiffness at the near end (1st Node) of an element, while the far end (2nd Node) is fixed (1)

(a) 3EI/L

(b) 6EI/L

(c) 4EI/L

(d) None of the above

(vi) Choose the correct statement. (1)

(a) The product of inertia of a cross section with 2 axes of symmetry is zero

(b) The product of inertia of a cross section with 1 axis of symmetry is zero

(c) Both (a) and (b) are correct

(d) Both (a) and (b) are wrong

(vii) A continuous beam ABC consists of two spans AB= 4 meters and BC=3 meters. The end A is fixed and the end C is simply supported. If I_{ab}: I_{bc} = 2:1, then the distribution factor at B for BA and BC are (2)

(a) 3/5 and 2/5 respectively

(b) 2/5 and 3/5 respectively

(c) 1/3 and 2/3 respectively

(d) 2/3 and 1/3 respectively

(viii) The degree of static indeterminacy of the following figure 1 is (2)

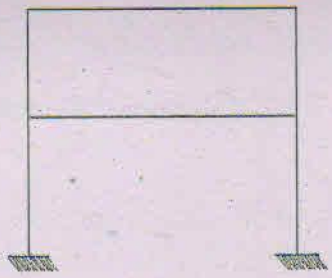

Figure 1

(a) 6

(b) 4

(c) 3

(d) 2

2. Using moment distribution method, analyze the portal frame shown in figure 2. The supports A and D are hinge support. All the members have same flexural rigidity. (10)

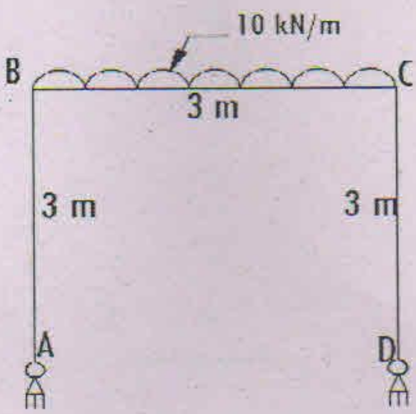

Figure 2

3. The figure 3 shows a continuous beam. The beam is uniform section throughout. Find the support moments using slope deflection method. (10)

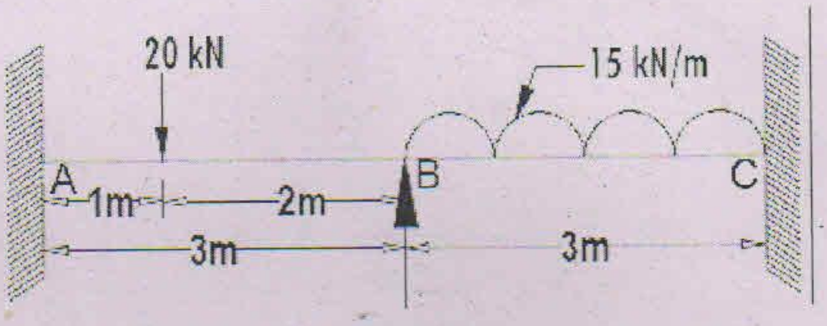

Figure 3

4. (a) Distinguish between Static and kinematic indeterminacy. (4)

   (b) Determine the product of inertia of the angle section 65 × 65 × 6 mm about the centroidal axis of the section. (6)

5. The ROTATION MATRIX for a member in a structure transforms LOCAL displacement and forces to GLOBAL displacement and forces respectively - Explain. Show that the ROTATION MATRIX for a horizontal member in a structure is a unit matrix. (10)

6. The beam element in a structure is made of Cocrete Grade M25, the Width X Depth = 300 mm X 500 mm; the Span of the beam element is 5.0 meter. Evaluate the Element Stiffness Matrix of the ELELMENT. (10)

7. Find the downward displacement of joint B in the truss shown in figure 4 by virtual work method. Area of cross section of each member is 400 mm². Take E=200kN/mm² ;AB = BC = 3 meter & BD= 4 meter. (10)

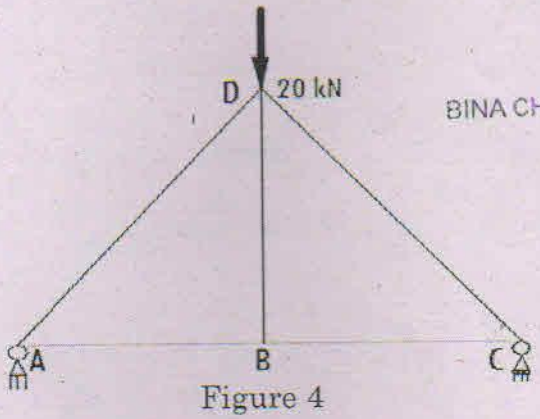

Figure 4

8. Locate the shear centre of the following section shown in figure 5. (All dimensions of the figure below are in mm) (10)

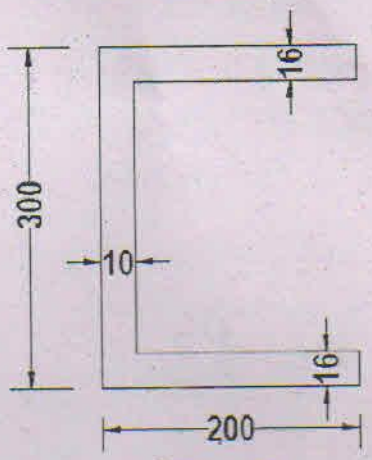

Figure 5

9. Establish the LOAD VECTOR in the structure for Matrix Analysis, having 4(Four) Nodes and 3 Elements as shown in the figure 6. (10)

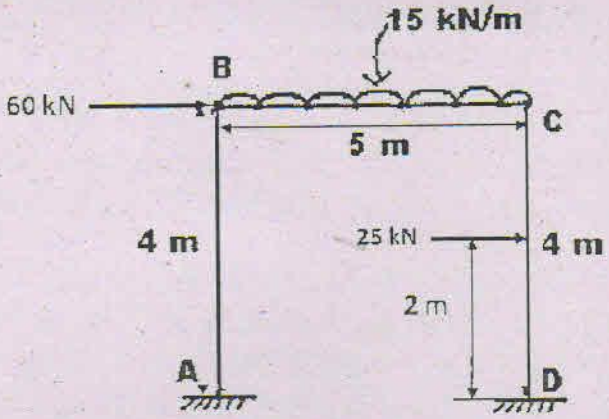

Figure 6