

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- Vth SEMESTER-EXAMINATION – MAY/JUNE - 2012****Subject code: 150605****Date: 06/06/2012****Subject Name: Structural Analysis III****Time: 02:30 pm – 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 Write answer in short (Two marks for each) **14**

- (1) Give any four examples for beams curved in plan.
- (2) In a circular beam (curved in plan) on several equally spaced supports, what are the quantities which will be zero at the supports and why?
- (3) Distinguish between plastic modulus and section modulus.
- (4) What is the value of fully plastic moment capacity of a square section of side 60 mm? $\sigma_y = 240$ MPa.
- (5) A propped cantilever beam has a uniform section, span l and flexural rigidity EI . What is the stiffness coefficient corresponding to rotation of the propped end?
- (6) The stiffness matrices of elements 1 and 2 in fig. 1 are given by

$$[K_1] = \begin{bmatrix} 12 & 6 \\ 6 & 12 \end{bmatrix} \quad [K_2] = \begin{bmatrix} 16 & 8 \\ 8 & 16 \end{bmatrix}$$
 Assemble them to get $[K]$ for the beam ABC.
- (7) The flexibility matrix of the structure in fig. 2 is

$$[f] = \begin{bmatrix} 4 & 2 \\ 2 & 3 \end{bmatrix}$$
 Find its stiffness matrix.

Q.2 (a) A fixed beam has a stepped section (ref. fig. 3). Find the energy dissipated if the hinges C and D move down by 0.03 m due to loads W and W at C and D. The plastic moments for member AC, CD and DB are 500 KNm, 300 KNm and 500 KNm respectively. **07**

(b) Determine the shape factor of unequal I section shown in fig.4. **07**

OR

(b) Determine collapse load in the fixed beam shown in fig. 5, in which plastic moment capacity is $2M_p$ in one half and M_p in the other half. **07**

Q.3 (a) Analyze the pin jointed plane frame shown in fig. 6 by flexibility matrix method. The members AB, BC and CD have a cross sectional area 6000 mm^2 and all other has 3000 mm^2 . **10**

(b) A propped cantilever beam as shown in fig. 7 has stiffness matrix of **04**

$$[K] = \begin{bmatrix} 120 & 60 \\ 60 & 40 \end{bmatrix}$$

Find the force at prop B when the prop sinks by 0.001 unit.

OR

Q.3 Draw the bending moment diagram for the frame shown in fig. 8 by stiffness matrix method. **14**

Q.4 (a) A curved beam in the form of a quadrant of a circle of radius R and having a uniform cross section is in a horizontal plane. It is fixed at A and free at B as shown in fig. 9. It carries a concentrated load W at the free end at B, compute SF, BM and TM at various sections and draw the corresponding diagrams. **07**

(b) For the above stated problem determine vertical deflection of the free end B. **07**

OR

Q.4 (a) A curved beam AB in the form of a quadrant of a circle of radius R and having a uniform cross section is in a horizontal plane. It is fixed at A and free at B as shown in fig. 10. It carries a uniformly distributed load w/unit run over entire length of the beam, as shown in fig. 10. Compute SF, BM and TM at various sections and draw the corresponding diagrams. **07**

(b) For the above stated problem determine vertical deflection of the free end B. **07**

Q.5 (a) Explain types of domes with neat sketches and state their uses. **07**

(b) Analyze the typical spherical dome subjected to point load at crown. **07**

OR

Q.5 (a) Explain with neat sketches “Stresses generated in Conical Dome”. **07**

(b) State and explain the basic assumptions made in the “Plastic theory”. **07**

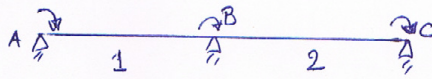


Fig. 1 Q.1 (6)



Fig. 2 Q.1 (7)

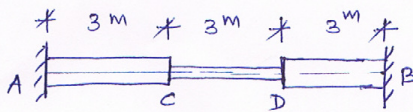


Fig. 3 Q.2 (a)

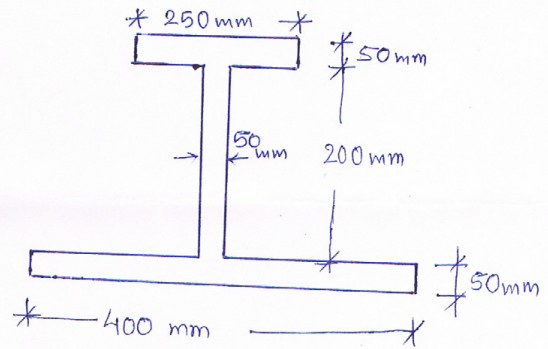


Fig. 4 Q.2 (b)

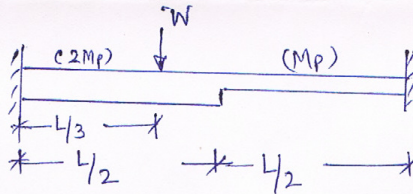


Fig. 5 (OR Q.2 (b))

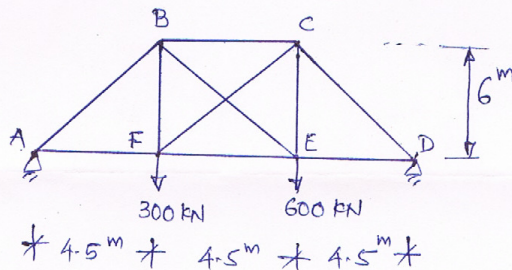


Fig. 6 (Q.3 (a))

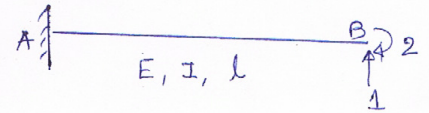


Fig. 7 (Q.3 (b))

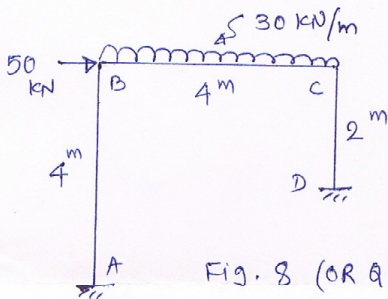


Fig. 8 (OR Q.3)

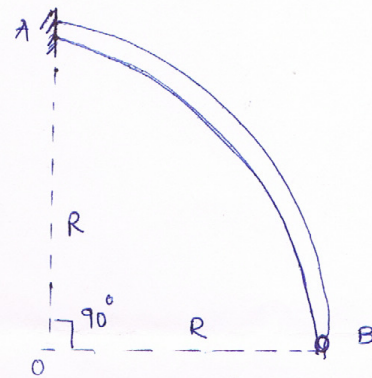


Fig. 9 (Q.4 (a) and (b))

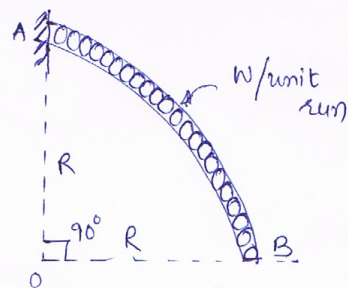


Fig. 10 (OR Q.4 (a) and (b))