Seat No.: _____ Enrolment No._____

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 modulas and section modulas.

(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 is in fig. 1 are given by

$$[K_1] = \begin{bmatrix} 12 & 6 \\ 6 & 12 \end{bmatrix} \; [K_2] = \begin{bmatrix} 16 & 8 \\ 8 & 16 \end{bmatrix}$$

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 2Mp in one half and Mp 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 deflaction 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 deflaction 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**

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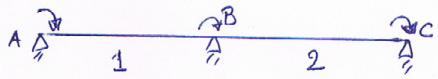

Fig. 1 Q. 1 (6)

Fig. 2 Q. 1 (7)

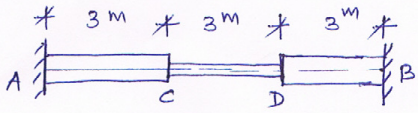

Fig. 3 Q. 2 (a)

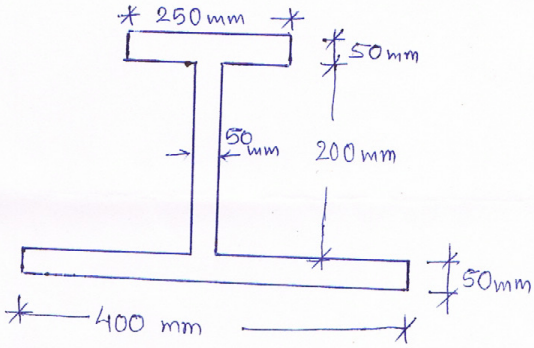

Fig. 4 Q. 2 (b)

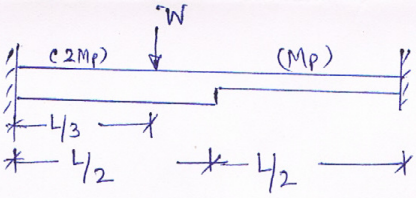

Fig. 5 (OR Q. 2 (b))

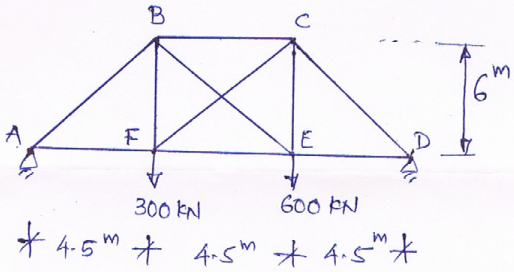

Fig. 6 (Q. 3 (a))

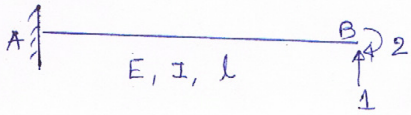

Fig. 7 (Q. 3 (b))

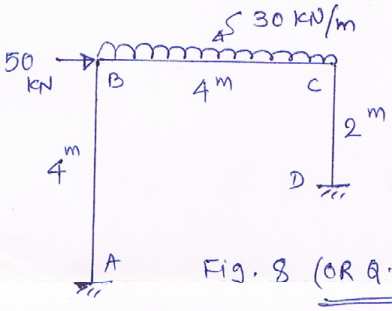

Fig. 8 (OR Q. 3)

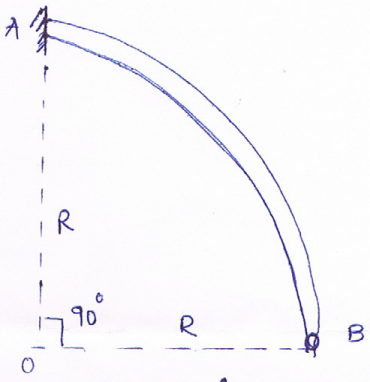

Fig. 9 (Q. 4 (a) and (b))

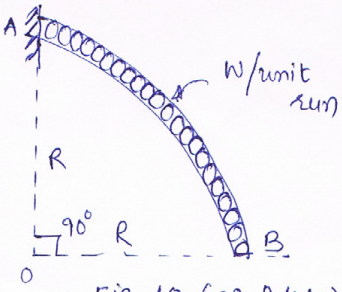

Fig. 10 (OR Q. 4 (a) and (b))

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