GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2018

Subject Code:2154001   **Date:16/11/2018**

Subject Name:Advanced Structural Analysis

**Time: 10:30 AM TO 01:00 PM**   **Total Marks: 70**

Instructions:
1. Q. 1 is compulsory.
2. Attempt all questions.
3. Make suitable assumptions wherever necessary.
4. Figures to the right indicate full marks.
5. IS 1893:2002 is allowed in the examination.

|			MARKS
Q.1	**(a)**	Difference between Portal Method and Cantilever Method in Structural Analysis.	03
	(b)	What is the importance of ILD in structural analysis,	04
	(c)	Calculate maximum bending moment at Section mn and pq of a five panel bridge. Each panel is of 9m. Five loads of 160 KN each spaced at 1.52m travel from right to left.	07
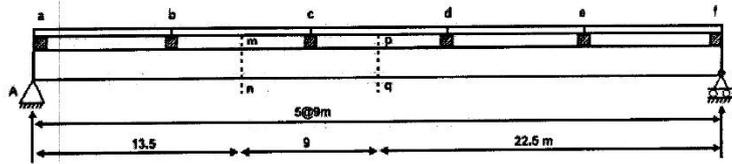
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Q.2	**(a)**	What are the basic stages in Moment distribution method?	03
	(b)	While applying the moment distribution method, a designer remembers that "nothing comes back from the fixed end". Justify.	04
	(c)	Analyze the frame by the moment distribution method. Draw the bending moment diagram.	07
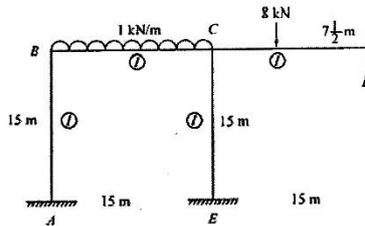
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	(c)	Analyze the continuous beam by moment distribution method. Draw the shear force diagram and bending moment diagram.	07
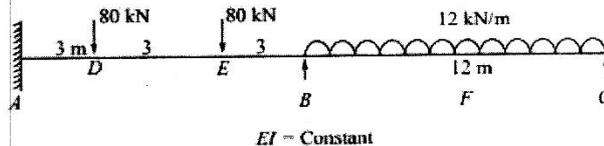
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Q.3	**(a)**	Define: Carry over factor, Distribution, Factor, Stiffness factor.	03

(b) A vertical column of 8 m height is to carry a crane girder load of 50 kN applied at an eccentricity of 0.2 m. Calculate the moments at A and B due to this load assuming both ends are fixed. **04**
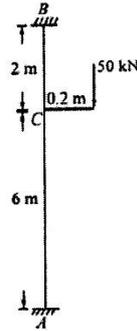

(c) A continuous beam ABC is carrying a uniformly distributed load of 1 kN/m in addition to a concentrated load of 10kN as shown in Fig.7.5a, Draw bending moment and shear force diagram. Assume EI to be constant for all members. AD=DB= 5m, BC=10m. Use Displacement Method. **07**
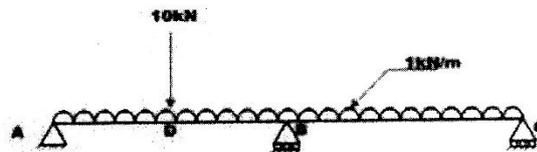

Q.3 (a) Derive the Castigliano's First theorem. **03**

(b) A horizontal beam ACB, three metres long is fixed at both ends A and B. They are at the same level. The member has a change of section at the centre of the span C such that the second moments of area are I for a distance AC and 2I for distance CB. A concentrated load of 500 kN acts at the midpoint C. Determine the fixing end moments at A and B. **04**
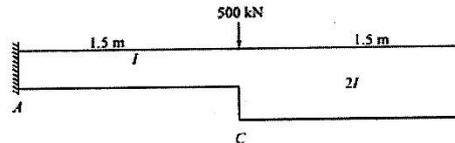

(c) A continuous beam ABC is carrying a uniformly distributed load of 1 kN/m in addition to a concentrated load of 10kN as shown in Fig.7.5a, Draw bending moment and shear force diagram. Assume EI to be constant for all members. AD=DB= 5m, BC=10m. Use Force Method. **07**
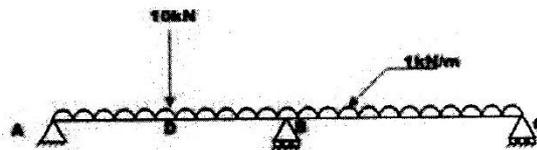
Q.4 (a) A portal frame ABCD has its end A hinged and end D is placed on-rollers. A horizontal force P is applied on the end D as shown in the following Figure. Find the stained energy stored in Frame. Assume all members have the same flexural rigidity. **03**
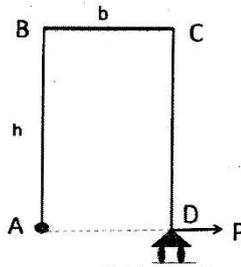
(b) Determine the horizontal movement of D in the above drawn frame in Q. 4 (a). **04**

(c) For the beam shown, use the stiffness method to: (a) Determine the deflection and rotation at B. (b) Determine all the reactions at supports. (c) Draw the quantitative shear and bending moment diagrams. **07**
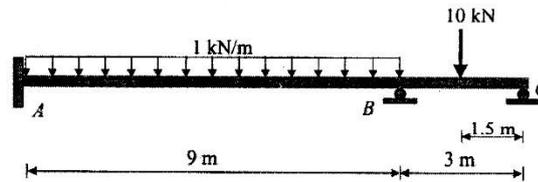
OR

Q.4 (a) Write a stiffness matrix/ flexibility matrix for 4 DoF system. **03**

(b) Distinguish between Flexibility Method and Stiffness Method used for analysis of structures. **04**

(c) For the beam shown, use the flexibility method to: (a) Determine the deflection and rotation at B. (b) Determine all the reactions at supports. (c) Draw the quantitative shear and bending moment diagrams. **07**
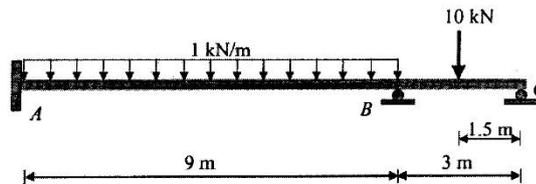
Q.5 (a) Explain four virtues of an earthquake resistant design. **03**

(b) Find the probable reinforcement details of the beam in Q.4 (c). **04**

(c) A five storeyed building has size of 30m x 30m. It is located in Bhuj and resting on hard soil. The weights of floors and height of the floors are 2000kN,, 2500kN, 2500kN, 2500kN and 2100kN AND 4.5m, 3.5m, 3.5m, 3.5m and 3.5m respectively from slab no.1 from bottom. Assuming the building as special moment resisting office building, calculate the horizontal shear forces acting at the each slab level by equivalent lateral force method. **07**

OR

Q.5 (a) Explain the plate tectonic theory and its mechanism. **03**

(b) Find the deflection of the beam in Q. 4 (c). **04**

(c) A Five storey hospital building having special moment resisting frame (SMRF) located in Ahmedabad on medium soil with following data: **07**
(i) No. of bay in x and y-direction = 4
(ii) Width of each bay = 5m
(iii) Thickness of slab =150 mm
(iv) Storey height = 3 m
(v) Size of beam and column = 300 mm x 450 mm

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(vi) Live load = 54 kN/m^2

Calculate Seismic Weight of the Building, Natural Period of Building, Base shear of building, Distribution of base shear as per IS 1893:2002. (Assume any additional data if required and neglect the weight of the infill wall panels.)

*****All the Best*****