

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2021****Subject Code:3140603****Date:04/09/2021****Subject Name:Structural Analysis-I****Time:02:30 PM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

Q.1 (a) Define statically determinate and indeterminate structures. **03**

(b) Explain Maxwell's theorem of reciprocal deflections. **04**

(c) Draw shear force, bending moment and axial force diagram for the rigid jointed frame shown in figure :1 **07**

Q.2 (a) What are the temperature effect on three hinge Arch? **03**

(b) A cable is suspended between two points at the same levels having span 120 m and central dip of 12 m. The cable carries an ULD of 2 kN/m on its horizontal span. Calculate the change in horizontal tension if temperature rises by 20°C. Take $\alpha = 12 \times 10^{-6}/C$. **04**

(c) A thin cylindrical shell of internal diameter d and wall thickness t , length l , is subjected to internal pressure p , Derive the expression for change in volume of the cylinder. **07**

OR

(c) Write steps for moment distribution method. **07**

Q.3 (a) What is Elastic strain energy. **03**

(b) Explain energy due to Shear Loading. **04**

(c) A simply supported beam AB of span 5m carries a uniformly distributed load of 5kN/m over its span. Determine the strain energy stored due to bending in the beam. Take $E=200 \text{ GPa}$, $I = 200\text{cm}^4$. **07**

OR

Q.3 (a) Explain Moment-area theorem 2. **03**

(b) Derive the relation between slope, Deflection and Radius of Curvature. **04**

(c) Calculate slope and deflection at point A, for a beam loaded as shown in figure : 07

2. $I = 3 \times 10^7 \text{ mm}^4$.

Q.4 (a) Explain limit of eccentricity and core of a section. 03

(b) What is conjugate beam? Differentiate between real beam and conjugate beam. 04
Justify the support condition in conjugate beam.

(c) A circular column 450 mm in diameter carries a load of 700 kN at an eccentricity of 100 mm. Calculate maximum and minimum stresses for the column. 07

OR

Q.4 (a) Define (a) Axial load (b) Eccentricity (c) Core of a section 03

(b) Define coefficient of Wind resistance. 04

(c) A rectangular retaining wall is 7.2m high retains water up to 6 m on its One side .The density of wall material and water is 23.5 kN/m^3 and 10 kN/m^3 respectively .Find minimum base width required to avoid tension at base. 07

Q.5 (a) State assumptions of Euler's formula. 03

(b) Differentiate between column and strut. 04

(c) A T section is having flange with 100mm and total depth 80 mm. The thickness of flange and web is 10 mm. The length of column is 3m and it is hinged at both ends. If $E = 2.1 \times 10^5 \text{ N/mm}^2$, find Euler's buckling load. 07

OR

Q.5 (a) What are the advantages and disadvantages of fixed beam. 03

(b) A fixed beam carries an UDL 'w' kN/m over entire span . Support 'B' settle by ' δ ' ,so that there is no fixed end moment at B. 04

(c) Find the fixing moments and end reaction for a fixed beam shown in figure.3. 07

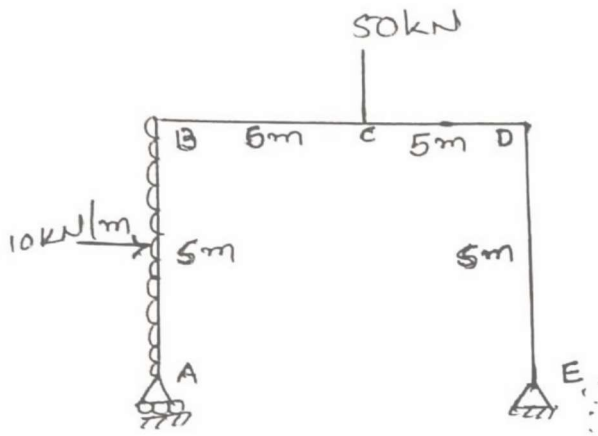


Fig: 1

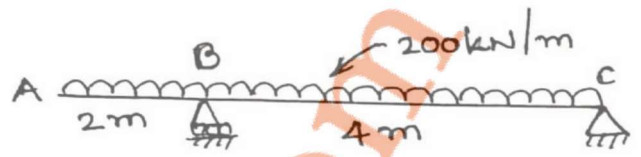


Fig: 2

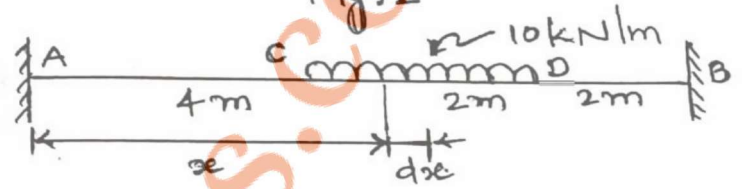


Fig: 3