GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2020

Subject Code:2140101   **Date:19/02/2021**

Subject Name:Aircraft Structures I

Time:02:30 PM TO 04:30 PM   **Total Marks:56**

Instructions:
1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define the terms: Determinate Structures & Indeterminate Structures.	**03**
	(b)	Explain Simple Truss, Complex Truss and Compound Truss with suitable sketches.	**04**
	(c)	State and prove "Maxwell's Reciprocal Theorem".	**07**
Q.2	**(a)**	Suggest the different ways of reducing the effect of buckling in long columns.	**03**
	(b)	Explain the Principle of Super position with its statement.	**04**
	(c)	Determine the position and value of maximum deflection in the beam as shown in fig.-1 using Macaulay's Method. Take EI as constant.	**07**
Q.3	**(a)**	State the significance of Zero Force Member in trusses.	**03**
	(b)	Derive the Differential Equation of an elastic curve.	**04**
	(c)	Determine the slope and deflection at free end of a cantilever beam having 4.0 m span and subjected to two equidistant point loads of 10 kN each. The flexural rigidity of first portion (i.e from fixed end) is 2EI and second portion (i.e from free end) is EI. Use any method of choice.	**07**
Q.4	**(a)**	Define: Proof Resilience and Modulus of Resilience.	**03**
	(b)	An I-Section has 260 mm depth and 120 mm width. Thickness of flange and web is 10 mm. It is used as a column with one end fixed and other hinged using Euler's Formula. Determine Safe Load using FOS = 3 and length of column = 8.0 m. Take $E = 2 \times 10^5 \, N/mm^2$.	**04**
	(c)	Find the internal forces in truss members for a plane truss as shown in fig. - 2 using Method of Tension Co-efficient.	**07**
Q.5	**(a)**	Explain Simple Harmonic Motion for the vibratory body.	**03**
	(b)	State the theorems of Moment Area Method.	**04**
	(c)	Derive the Euler's equation for effective length of long column if both the ends of the column are hinged.	**07**
Q.6	**(a)**	Define: Slenderness Ratio and Radius of Gyration.	**03**
	(b)	Enlist the various methods to determine slope and deflection in determinate structures.	**04**
	(c)	Derive the expression for determining tension coeffient in any member of a plane truss.	**07**
Q.7	**(a)**	Define the terms: Amplitude and Frequency.	**03**
	(b)	State the rules to be followed for analyzing a beam using Macaulay's Method.	**04**

(c) A steel rod having length 4.0 m and 40 mm diameter is subjected to an axial pull of 160 kN that is suddenly applied. Determine the instantaneous stress and instantaneous elongation produced in the rod. Take $E = 2 \times 10^5$ N/mm^2. **07**

Q.8 **(a)** Explain D'Alembert's Principle. **03**

(b) State the assumptions and limitations of Euler's Theory of Column Buckling. **04**

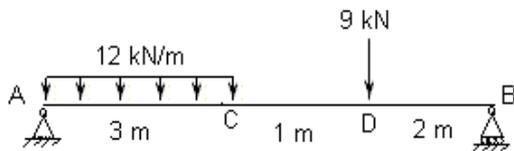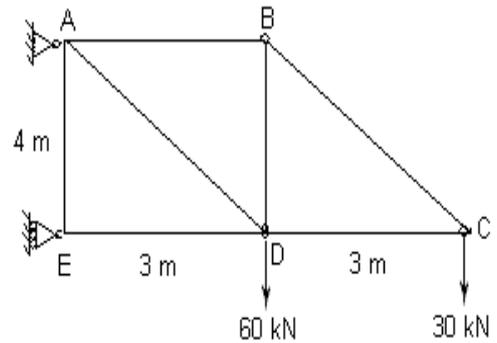**(c)** Derive the equation for strain energy induced in a body due to shear. **07**

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Figure-1

Figure-2