GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2021

Subject Code:2140101   **Date:08/09/2021**
Subject Name: Aircraft structures-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.**

			MARKS
Q.1	**(a)**	Define: (1) Strain Energy, (2) Buckling load, (3) Slenderness Ratio.	**03**
	(b)	Derive the equation of strain energy stored in a material by sudden load.	**04**
	(c)	A square column of 100 mm x 100 mm in size and length 8 m with one end support fixed and other hinged is subjected to a axially compression load. Determine the Euler's buckling load. Assume that the column is laterally unsupported throughout its length. Take E= 200 kN/mm^2.	**07**
Q.2	**(a)**	Differentiate: Simple Truss, Compound Truss and Complex Truss with suitable sketch.	**03**
	(b)	Define static indeterminacy. Write generalized formula to calculate SI for Beams, plane truss, plane frame	**04**
	(c)	A mass of 35 kg is dropped on to a collar at the end of a vertical bar 2.5 m long and 25 mm in diameter, from a height of 100 mm. Calculate the maximum instantaneous stresses and extension produce in the section of bar. E = 200 kN/mm^2.	**07**

OR

	(c)	Define the terms: Static Indeterminacy and Kinematic Indeterminacy. Find the S.I and K.I of a plane frame as shown in Figure-1.	**07**
Q.3	**(a)**	Suggest different way of reducing the effect of buckling in long column.	**03**
	(b)	Enlist various methods to find slope and deflection. Mention the assumptions required for deriving the differential equation	**04**
	(c)	A bar 54 mm in diameter is 4 m long. An axial load of 180 kN is suddenly applied to it. Find maximum instantaneous stress, maximum instantaneous elongation and the work stored in the bar. Take E = 2 x 10^5 N/mm^2.	**07**

OR

Q.3	**(a)**	Explain De'alembert Principal.	**03**
	(b)	State the assumptions and limitations of Euler's Theory of Column Buckling.	**04**
	(c)	A hollow cast iron column has outside diameter 200mm and thickness of 20mm. It is 4.5m long and fixed at both ends. Calculate the safe load and ratio of Euler's critical load. E= 0.8 x 10^5 N/mm^2.	**07**
Q.4	**(a)**	Differentiate between column and strut	**03**
	(b)	State and explain "Maxwell's reciprocal theorem".	**04**
	(c)	Determine the position and value of maximum deflection in the beam as shown in fig.-2 using Macaulay's Method. Take EI is constant	**07**

OR

Q.4	**(a)**	Enlist the methods used to calculate slope and deflection in beams.	**03**
	(b)	What is conjugate beam? Explain different end conditions used in conjugate beam with respect to end conditions in real beam.	**04**

(c) Determine the maximum deflection in a simply supported beam as shown in fig.-3 using Moment area Method. Take $E = 200$ kN/mm^2 and $I = 10^9$ mm^4. **07**

Q.5 **(a)** Define: Time Period, Amplitude and Natural Frequency **03**

(b) Derive moment – curvature relationship for deflection of a beam along with suitable assumptions. **04**

(c) Determine the maximum deflection in a simply supported beam as shown in fig.-3 using Double Integration Method. Take $E = 200$ kN/mm^2 and $I = 10^9$ mm^4 **07**

OR

Q.5 **(a)** Explain simple harmonic motion of a vibrating body. **03**

(b) Discuss the stepwise procedure of Tension Coefficient method to calculate member forces in truss. **04**

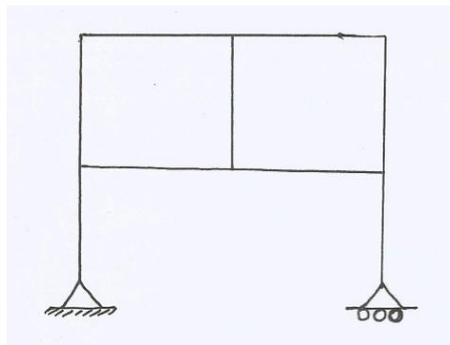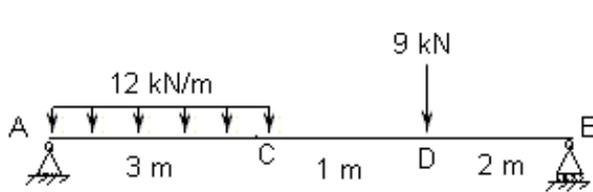**(c)** Discuss Maximum Principal Stress theory briefly. **07**
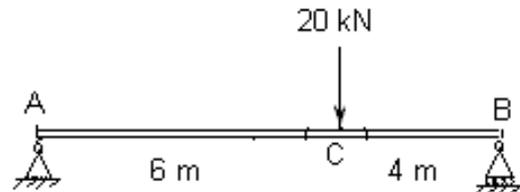

Fig:1

Fig:2

Fig:3