Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – SUMMER 2013

Subject Code: 140101 **Date: 12-06-2013**

Subject Name: Aircraft Structure - I

Time: 10:30am – 01:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define the terms: 1-) Resilience. 2-) Slenderness Ratio.	**02**
	(b)	State and explain the "Maxwell's Reciprocal Theorem".	**02**
	(c)	What do you mean by term Boundary Condition? State its importance in structural analysis.	**02**
	(d)	State Moment Area Theorems.	**02**
	(e)	Draw a probable sketch which shows a buckle shape of a long column for following support conditions; 1-) Both the ends are fixed. 2-) Both the ends are Free. 3-) One end fix and other end is free. 4-) One end fix and other is hinged.	**04**
	(f)	Justify the statement by giving suitable example: " Indeterminate structure is more stable than that of determinate structure"	**02**
Q.2	**(a)**	What do we mean by Static Indeterminacy (SI) and Kinematic Indeterminacy (KI) of a structure? Find the SI and KI of a structure shown in fig.-1 (plane frame) and fig.-2 (plane truss).	**07**
	(b)	Analyze the Plane truss as shown in fig.-3 using Method of Tension Co-efficient.	**07**
		OR	
	(b)	Analyze the space truss as shown in fig.-4 using Method of Tension Co-efficient. The force 100 kN applied at joint E acting towards the joint D.	**07**
Q.3	**(a)**	State the assumption made in Euler's buckling theory of long column and derive the formula for buckling load of a long column.	**07**
	(b)	A simply supported beam having length 10 m is subjected to a downward point load of 20 kN at a distance 6 m from left end support. Determine the rotation at left end support and deflection at the canter span of a beam using Double Integration Method. Take E= 200 kN/mm^2 and I = 10^9 mm^4.	**07**
		OR	
Q.3	**(a)**	Determine the deflection at point D for an overhang beam as shown in fig.-5 using Moment area Method. Take E= 200 kN/mm^2 and I = 10^9 mm^4.	**07**
	(b)	Determine slope and deflection at the free end of a cantilever beam as shown in Fig.-6 using Macaulay's Method. Take E= 200 kN/mm^2 and I = 10^9 mm^4.	**07**
Q.4	**(a)**	Explain plane stress problem by giving suitable example. Also write the stress-strain relationship for the same.	**07**

(b) In a plain strain problem, we have stress $f$xx = 1400 MPa, $f$yy = -100 MPa, young modulus E = 200 GPa and passion ratio μ = 0.3. Determine the value of stress $f$zz. **07**

OR

Q.4 **(a)** Explain plane strain problem by giving suitable example. Also write the stress-strain relationship for the same. **07**

(b) A cantilever beam of a rectangular cross section (b x having length "L" is subjected to a point load "F" at free end. Considering the stress function € = Axy + Bxy^3, investigate the stress field and by satisfying the boundary conditions, obtain the stress distribution in a beam. **07**

Q.5 **(a)** Derive the strain energy equation for a member subjected to a bending moment. **07**

(b) Calculate the total strain energy stored in a 6 m long cantilever beam subjected to a u.d.l. of 10 kN/m throughout the length. The cross section of a beam is rectangle having dimension 100 mm x 300 mm. Take E = 200 kN/mm^2 and G = 80 kN/mm^2. **07**

OR

Q.5 **(a)** Derive the strain energy equation for a member subjected to Torsion. **07**

(b) Write the different required characteristics of the Aircraft structure. Why hollow section and I-sections are preferred for aircraft structure? **07**

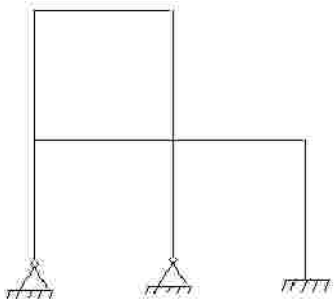

Fig.-1

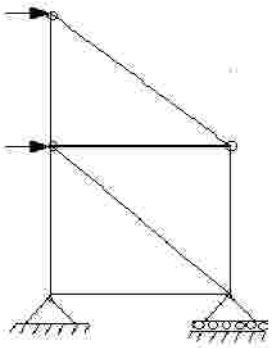

Fig.-2

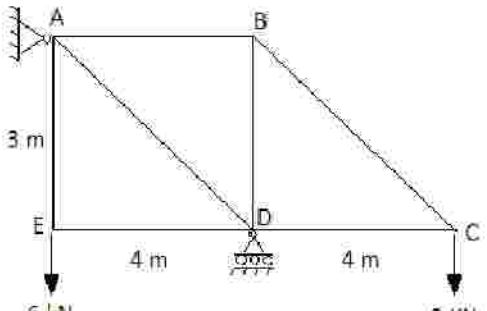

Fig.-3

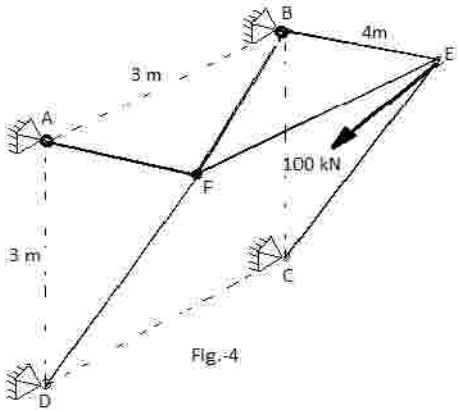

Fig.-4

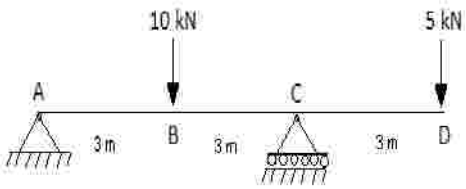

Fig.-5

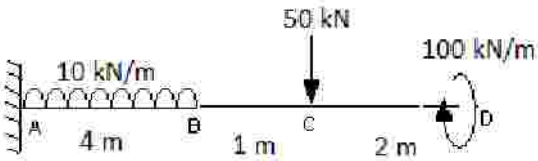

Fig.-6

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