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GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2140101 **Date:17/11/2018**

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.**

Q.1	(a)	Conjugate beam method is a modified form of _____	01
	(b)	A truss is considered as deficient or unstable truss if _____	01
	(c)	In actual structure, if the support is fixed then it is modified to _____ in conjugate beam.	01
	(d)	For a determinate beam, the value of S.I. is always _____	01
	(e)	The total degree of freedom at each joint in case of plane truss is _____	01
	(f)	The strain energy due to sudden load is _____ times the strain energy due to gradual load.	01
	(g)	The elastic energy stored due to shear loading is known as _____	01
	(h)	The axis of the loaded beam that bends in a curve is known as _____	01
	(i)	The number of vibration cycles completed in one second is referred as _____	01
	(j)	The graphical integration of M/EI diagram between any two points on elastic curve on a beam will give _____	01
	(k)	The ratio of effective length of column to radius of gyration is referred as _____	01
	(l)	The differential equation of the elastic curve is given by _____	01
	(m)	The angle through which the cross-section rotates with respect to the original position is called as _____	01
	(n)	For the statically determinate structure, the value of S.I. is always _____	01
Q.2	(a)	State the Principal of Virtual Work.	03
	(b)	Explain Euler's theory of long column along with suitable assumption.	04
	(c)	Define the terms: 1-) Static Indeterminacy 2-) Kinematic Indeterminacy. Find the S.I and K.I of a plane frame as shown in fig.-1.	07
		OR	
	(c)	State and prove "Maxwell's Reciprocal Theorem".	07
Q.3	(a)	Explain Simple Harmonic Motion for the vibratory body.	03
	(b)	Enlist the criteria to identify the geometric instability of the structure.	04
	(c)	An I-Section has 360 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 = 6.0 m. Take E = 2×10^5 N/mm^2.	07

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OR

Q.3	(a)	Define the terms: Strain Energy, Proof Resilience and Modulus of Resilience.	03
	(b)	State the limitations of Euler's Theory of Column Buckling.	04
	(c)	A bar 40 mm in diameter is 4 m long. An axial load of 120 kN is suddenly applied to it. Find maximum instantaneous stress, maximum instantaneous elongation and the work stored in the bar. Take $E = 2 \times 10^5$ N/mm^2.	07
Q.4	(a)	Define: Time Period, Amplitude and Natural Frequency	03
	(b)	Enlist various methods to find slope and deflection. Mention the assumptions required for deriving the differential equation.	04
	(c)	A mass of 25 kg is dropped on to a collar at the end of a vertical bar 2 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

Q.4	(a)	Explain the Principle of Super position with its statement.	03
	(b)	Define the term Effective Length of Column. Draw the probable sketch which represent the buckled shape of the column with different support conditions.	04
	(c)	Determine the position and value of maximum deflection in the beam as shown in fig.-2 using Macaulay's Method. Take EI as constant.	07
Q.5	(a)	Define: Simple Truss, Compound Truss and Complex Truss.	03
	(b)	Explain D'Alembert's Principle.	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)	Define: Crushing Load, Slenderness Ratio and Radius of Gyration.	03
	(b)	Derive moment – curvature relationship for deflection of a beam along with suitable assumptions.	04
	(c)	Find the internal forces in truss members for a plane truss as shown in fig. - 4 using Method of Tension Co-efficient.	07

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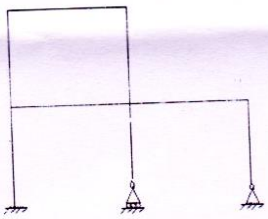

Figure-1

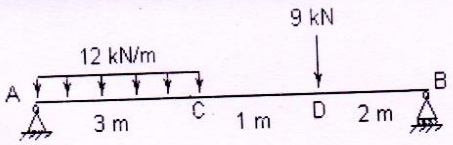

Figure-2

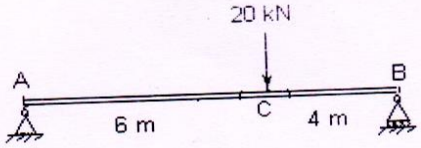

Figure-3

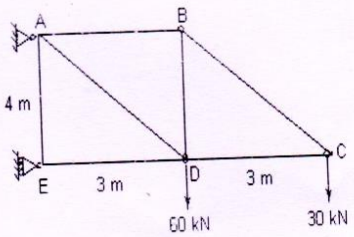

Figure-4

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