Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2015

Subject Code: 2140101 **Date:01/06/2015**

Subject Name: Aircraft Structure I

Time: 10:30am-1.00pm **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)**	The graphical integration of M/EI diagram between any two points on elastic curve on a beam will give _____.	**01**
	(b)	In a Conjugate Beam method the maximum deflection in a beam is take place at a point where _____.	**01**
	(c)	If the strain energy stored in bar due to sudden axial load is 200 kN-m, than the strain energy stored in a bar due to same magnitude of gradual axial load is _____.	**01**
	(d)	The magnitude of an effective length of a column having both the ends fixed and length "L" is _____.	**01**
	(e)	The number of independent coordinate required to represent the position of a body during vibration is referred as _____.	**01**
	(f)	Identify the zero force members in a truss as shown in fig.1	**01**
	(g)	Write the general equation of motion for a spring mass model of a SDOF vibration.	**01**
	(h)	For a determinate beam the value of S.I. is always _____.	**01**
	(i)	Differentiate: simple truss, compound truss and complex truss by giving suitable sketch.	**02**
Q.2	**(a)**	State and prove "Maxwell Reciprocal Theorem".	**07**
	(b)	Define the terms: 1-) Static Indeterminacy 2-) Kinematic Indeterminacy. Find the S.I and K.I of a plane frame as shown in fig.-2.	**07**
		OR	
	(b)	State the criteria which are required to be satisfied in order to ensure the geometric stability of a structure. Also comment on geometric stability of a structure as shown in fig.-3 a-) and b-) by giving suitable justification.	**07**
Q.3	**(a)**	Find the support reaction for a beam as shown in fig.-4 using principal of virtual work.	**07**
	(b)	Find the internal forces in truss members for a plane truss as shown in fig. - 5 using Method of Tension Co-efficient.	**07**
		OR	
Q.3	**(a)**	The bent rigid rod ABC as shown in fig.-6 has negligible mass and supports a 5 kg collar at its end. The bar in hinged at B. Develop the equation of a vibratory motion and determine the natural time period of vibration.	**07**
	(b)	The state of plane stress as shown in fig.-7 occurs at a critical point of a steel machine component for which the tensile yield strength is 250 MPa. Determine the factor of safety with respect to yielding using Maximum shear Stress Theory.	**07**
Q.4	**(a)**	Derive moment – curvature relationship for deflection of a beam along with suitable assumptions.	**07**
	(b)	Determine the position and value of maximum deflection in the beam as shown in fig.-8 using Macaulay's Method. Take EI is constant.	**07**

OR

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

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

Q.5 **(a)** Explain Euler's theory of long column along with suitable assumption. **07**

(b) A cantilever beam of 6 m length and having rectangular cross section of 150 mm x 300 mm is subjected to a u.d.l. of 18 kN/m throughout the length of a beam. Find the total strain energy stored in a beam due to bending and shear. Take E = 200 kN/mm^2 and G = 80 kN/mm^2. **07**

OR

Q.5 **(a)** A mild steel tube 25 mm internal diameter, 32 mm external diameter, length 3 m is used as a strut, one end fixed, the other hinged. Calculate the Euler's buckling load. Take E = 2 x 10^5 N/mm^2. **07**

(b) 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**

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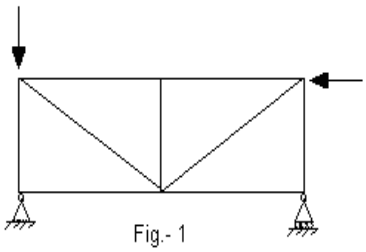

Fig.- 1

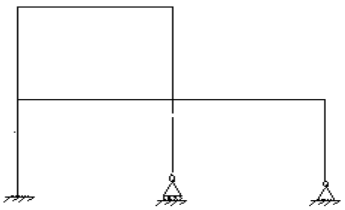

Fig. - 2

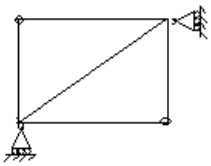

Fig. - 3 (a)

Fig. - 3 (b)

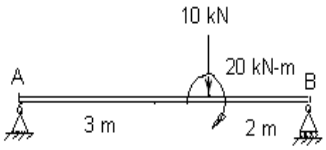

Fig. - 4

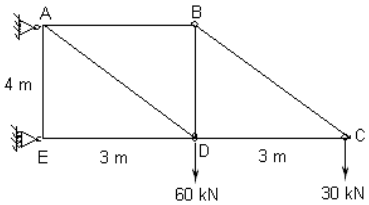

Fig.-5

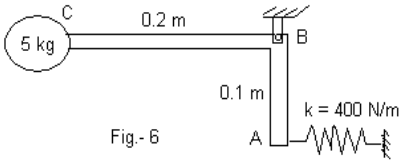

Fig.- 6

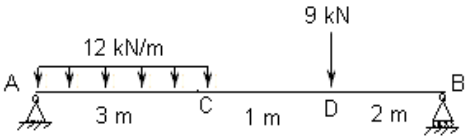

Fig.- 8

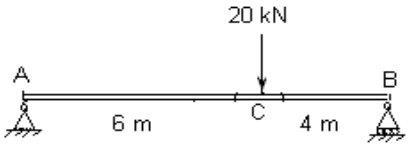

Fig.- 9

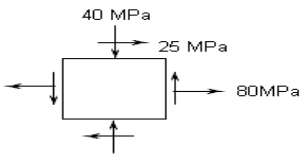

Fig.- 7