Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (New) EXAMINATION – WINTER 2015

Subject Code:2140101 **Date:30/12/2015**

Subject Name:Aircraft Structure-I

Time: 02:30pm to 05:00pm **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)**	For internal hinge in real beam, the equivalent support in conjugate beam is __.	**01**
	(b)	The static and kinematic boundary conditions available on slider support are _____ and _____ respectively.	**02**
	(c)	For a statically determinate structure, the value of S.I. is always _____.	**01**
	(d)	The graphical integration of first moment of M/EI diagram between any to point on elastic curve gives _____.	**01**
	(e)	The basic 4th order differential equation for beam deflection is _____.	**01**
	(f)	In small deflection theory, the effect of _____ is not considered.	**01**
	(g)	Match the following 1-) Double Integration Method — Semi-Graphical Method 2-) Moment Area Method — Method of Singularity Function 3-) Macaulay's Method — Static Beam Method 4-) Conjugate Beam Method — Direct Integration Method	**02**
	(h)	The effect of buckling is present only in _____ member.	**01**
	(i)	The ratio of effective length of column to radius of gyration is referred as ____.	**01**
	(j)	The change in length of a bar subjected to suddenly applied axial load is 10 mm. When the same bar is subjected to same magnitude of gradually applied axial load, the change in length of bar is _____.	**01**
	(k)	The vibration of any system is takes place about its _____.	**01**
	(l)	The periodic motion of a rigid body is generally referred as _____.	**01**
Q.2	**(a)**	Define the following Terms: 1-) Effective Length 2-) Strain Energy 3-) Proof Resilience 4-) Static Indeterminacy (KI) 5-) Kinematic Indeterminacy (KI) 6-) Time Period (T) 7-) Boundary Condition.	**07**
	(b)	State and prove Maxwell Reciprocal Theorem.	**07**
		OR	
	(b)	Find SI and KI of a plane rigid jointed frame, beam and truss as shown in fig.-1, 2 and 3.	**07**
Q.3	**(a)**	Analyze the truss as shown in fig.-3, using Tension Co-efficient method.	**07**
	(b)	A weight W = 25 N falls freely along a rod until it strikes the nut at the bottom fixed from a height of 500 mm. If the diameter of the rod is 10 mm and the length of the rod is 800 mm, find the maximum instateneous stresses and amount of strain energy stored in rod caused by the falling weight. Take E= 200 kN/mm^2.	**07**
		OR	
Q.3	**(a)**	1-) Identify the zero force members in a plane truss as shown in fig.-4. 2-) State the difference between Simple Truss, Compound truss and Complex Truss along with suitable sketch.	**07**

	(b)	Calculate the amount of strain energy stored in a beam ABC in plan as shown in fig.-5. Take E= 200 kN/mm^2 and G= 80 kN/mm^2.	07
Q.4	(a)	Derive Moment Curvature Relationship of an elastic beam along with suitable assumptions.	07
	(b)	Find the deflection at point 'C' and rotation at point 'B' for a beam as shown in fig.-2 using Macaulay's Method. Take EI = 20000 kN/m^2.	07
		OR	
Q.4	(a)	Find the deflection at point 'C' and rotation at point 'B' for a beam as shown in fig.-2 using Moment Area Method. Take EI = 20000 kN/m^2.	07
	(b)	Find the deflection at point 'C' and rotation at point 'B' for a beam as shown in fig.-2 using Conjugate Beam Method. Take EI = 20000 kN/m^2.	07
Q.5	(a)	Find the reaction for a beam as shown in fig.-2, using Principal of virtual work.	07
	(b)	A circular column of diameter 150 mm and length 8 m with one end support fixed and other hinged is subjected to a axially compression load. Determine the effective length of column, slenderness ratio and the buckling load. Assume that the column is laterally unsupported throughout its length. Take E= 200 kN/mm^2.	07
		OR	
Q.5	(a)	A solid circular shaft is subjected to a bending moment of 30 kN-m and a torque of 15 kN-m. Design the diameter of shaft according to maximum principal stress theory. Take stress at elastic limit 200 N/mm^2 and Factor of safety 2.	07
	(b)	Find the natural frequency of a semicircular steel disc as shown in fig.-6 of diameter 200 mm, if it is initially disturbed form its equilibrium position. Take density of steel as 78 kN/m^3.	07

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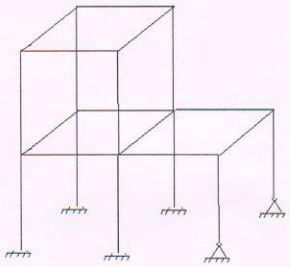

Fig.-1

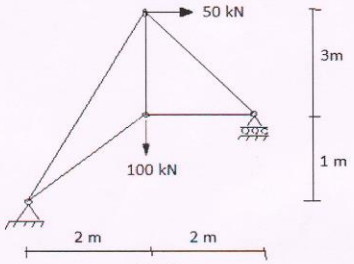

Fig.-3

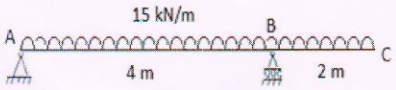

Fig.-2

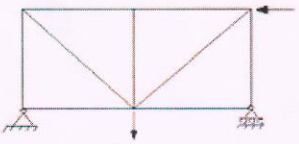

Fig.-4

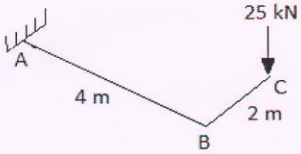

Fig.-5

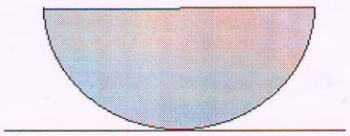

Fig.-6