Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2140101 Date:28/05/2019

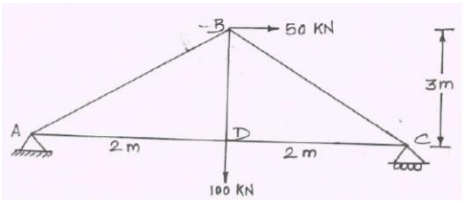
Subject Name: Aircraft Structures I

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

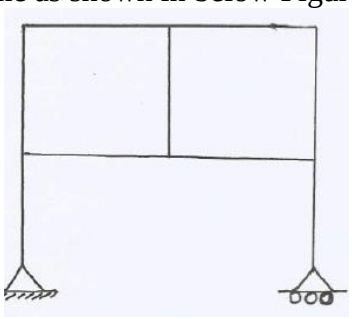
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define : Stress,Strain,Shear Modulus	**03**
	(b)	State and Explain " Maxwell's Reciprocal Theorem "	**04**
	(c)	Define the following term : Strain Energy,Radious of gyration,moment of inertia,resilience,proof resilience,Young's Modulus	**07**
Q.2	**(a)**	Explain with figure : Point load,moment,Uniformly varying load	**03**
	(b)	Enlist the criteria to identify the geometric instability of the structure.	**04**
	(c)	Analyse the plane truss shown in below Figure using Tension Coefficient Method.	**07**

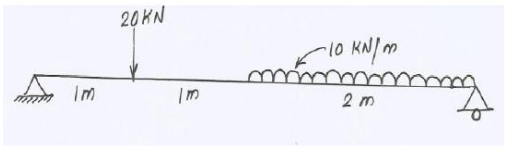


OR

	(c)	Define the terms: Static Indeterminacy and Kinematic Indeterminacy. Find the S.I and K.I of a plane frame as shown in below Figure.	**07**



Q.3	**(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)	A beam AB of 4.0 m span is simply supported at the ends and is loaded as shown in below figure. Determine (i) Deflection at C, (ii) Maximum deflection, and (iii) Slope at the end A. Take the value of E = 200 x 10^6 kN/m^2 , I = 20 x 10^{-6} m^4. Use Macaulay's Method.	**07**



OR

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)	Derive euler's buckling load for fixed free column.	**07**
Q.4	**(a)**	Define: Time Period, Amplitude and Natural Frequency	**03**
	(b)	Differentiate between: Column and Strut	**04**
	(c)	Derive moment – curvature relationship for deflection of a beam along with suitable assumptions.	**07**

OR

Q.4	**(a)**	Explain the principal of virtual work.	**03**
	(b)	Differentiate: Simple Truss, Compound Truss and Complex Truss with suitable sketch.	**04**
	(c)	A strut 2.5 m long is 50 mm in diameter. One end of the strut is fixed while its other end is hinged. Find the safe load for the member using Euler's Theory, allowing Factor of Safety as 3.5. Take E = 2.1 x 10^5 N/mm^2.	**07**
Q.5	**(a)**	Explain Euler's theory of long column along with suitable assumption.	**03**
	(b)	A circular ring of radius 'R' is oscillating about one point on its periphery when it get slightly disturb form its original equilibrium position about that point. Derive an equation of time period (T) for the oscillation of ring.	**04**
	(c)	A solid circular shaft is subjected to a bending moment of 40 kN-m and a torque of 10 kN-m. Design the diameter of shaft according to maximum strain energy theory. Take stress at elastic limit 200 N/mm^2 and Factor of safety 2.	**07**

OR

Q.5	**(a)**	Explain De'alembert Principal.	**03**
	(b)	A hollow rectangular column having outside dimensions 200 mm x 150 mm and inside dimensions 150 mm x 100 mm. It's length is 6.0 m and both ends are fixed. Find the Euler's Load if E = 2 x 10^5 N/mm^2.	**04**
	(c)	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 the shaft according to maximum principle stress theory. Take stress at elastic limit as 200 N/mm^2 and Factor of safety as 2.	**07**

****