GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 3130608   **Date: 5/12/2019**
Subject Name: Mechanics of Solids
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.

			MARKS
Q.1*	**(a)**	Define: (1) Rigid body, (2) Newton's second Law	03
	(b)	Define Force and classify the force system with neat sketch.	04
	(c)	Find magnitude and direction of resultant of force system shown in Fig.1	07
Q.2	**(a)**	Define Moment & Couple giving two suitable examples	03
	(b)	State Hook's low. Draw stress strain curve for Mild Steel Specimen and explain each point in detail.	04
	(c)	A Chord supported at A,B carries a load of 20kN at point C and unknown weight W kN at D as shown in fig 2.Find the value of unknown weight W. So that CD remains horizontal.	07
		OR	
	(c)	Determine Ixx and Iyy for section shown in fig 3	07
Q.3	**(a)**	Define (i) Strain (ii) Poisson's ratio (iii) Bulk Modulus	03
	(b)	Find support reaction for a beam as shown in figure. 4	04
	(c)	A Reinforced concrete column is applied 700 kN load. Size of column is 300 mm X 400 mm, and it is reinforced with 6 bars of 16 mm dia. Determine load taken by concrete and steel.	07
		OR	
Q.3	**(a)**	Define (1) Ductile material (2) Compound bar (3) Axial load	03
	(b)	Find support reactions for a beam as shown in figure. 5	04
	(c)	A 2.8 m long member is 60 mm deep and 40 mm wide. It is subjected to axial tensile force 210 kN. Determine change in dimension and in volume. Take E=200 Gpa and μ = 0.3 Assume Esteel and Econcrete	07
Q.4	**(a)**	Derive the formula for the elongation of a rectangular bar under the action of axial load.	03
	(b)	Explain with neat sketch types of beams, types of loads and types of supports	04
	(c)	A steel rod 25mm in diameter is inserted inside a brass tube of 25mm internal diameter and 35mm external diameter, the ends are rigidly connected together. The assembly is heated by 30^0C. Find value and nature of stress developed in both the materials. Take, E_{steel} = 200GPa, E_{brass} =80 GPa, α_{steel} =12 x 10-6 per ^{0}C, α brass =18 x 10-6 per ^{0}C.	07
		OR	
Q.4	**(a)**	Write the assumption made in theory of pure torsion.	03
	(b)	Derive the equation for deformation of a body due to self weight.	04
	(c)	Draw Shear Force and Bending Moment diagram for the beam shown in fig. 6	07
Q.5	**(a)**	Define: 1)Point of Contra flexure, 2) Shear force	03
	(b)	Derive assumption made in analysis of truss.	04
	(c)	Analysis the truss loaded as shown in figure. 7	07

<div align="center">OR</div>

Q.5 (a) \Vn *te* a differ *ence* between *Truss* and frame.   03
     (b) Explain perfect truss and imperfect truss with the sketches.   04
     (c) Analysis the truss loaded as shown in figure 8   07

Fig. 1

60 KN
30 KN
25°
30°
75°
45°
x
50 KN
70 KN
y

Fig. 1   Q.1 (c)

Fig. 2

A 60°
B 30°
D
C
W = ?
KN
20 KN

Fig. 2
Q.2 (c)

Fig. 3

150
50
50
200
All DIM
are in
mm
50

Fig. 3   Q.2 (c)

Fig. 4

5 KN/m
5 KN.m
15 KN
A
B   2m   C   1m   D   2m   E
3m

Fig. 4   Q.3 (b)

Fig. 5

8 KN/m
20 KN
15 KN
A
3m   4m   3m   B   2m
A

Fig. 5   Q.3 (b)

Fig. 6

50 KN
60 KN
80 KN
A
C   D   E
B
3m
5m
8m
10 m

Fig. 6   Q.4 (c)

Fig. 7

20 N
90°
A 30°
60° B
3m

Fig. 7   Q.5 (c)

Fig. 8

40 KN
50 KN
B
C
A 60°
60°
60° D
2m   E   2m

Fig. 8   Q.5 (c)