Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (New) EXAMINATION – WINTER 2018

Subject Code:2130608 Date:01/12/2018

Subject Name:Strength of Materials

Time:10:30 AM TO 01:00 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: - factor of safety, working stress, hardness	**03**
	(b)	Enlist various type of loads and type of supports.	**04**
	(c)	Find support reaction for the beam show in Fig.1	**07**
Q.2	**(a)**	Explain the sign convention taken to compute shear force and bending moment	**03**
	(b)	Draw a shear stress distribution diagram for the following section i) Rectangular ii) Circular section iii)I-section iv)T-section	**04**
	(c)	Draw shear force and bending moment diagram for the beam as shown in fig 2.	**07**
		OR	
	(c)	A Cantilever beam of Length of 3.0 m carries UDL of 2.5 kN/m run over half span of length from fixed end and a point load of 3 kN at a distance of 1 m from free end. Calculate shear force and bending moments and plot the S.F. and B.M. diagram	**07**
Q.3	**(a)**	What is Point of Contra flexure? What is its significance?	**03**
	(b)	Explain behavior of brittle materials under tension (stress strain curve for brittle materials)	**04**
	(c)	A beam having an I section with top flange 100mm x40mm, web 120mm x30mm and bottom flange 200mm x40mm, simply supported over span of 5m is subjected to uniformly distributed load over entire span. If bending stress is limited to 40N/mm^2 (tensile) and 120 N/mm^2 compressive, find max. Value of UDL the beam can carry if the larger flange is in tension.	**07**
		OR	
Q.3	**(a)**	Explain the Principal Planes, Principal Stresses and Natural Axis	**03**
	(b)	Explain MOHR'S Circle of stress.	**04**
	(c)	At a Point strained material there is tensile stress of 100 N/mm2 upon a horizontal plane and a compressive stress of 50 N/mm2 upon a vertical plane. There is also a shear stress of 60 N/mm2 upon each of these planes. Determine the planes of maximum shear stress at the point. Determine also the resultant stress on the planes of maximum shear stress	**07**
Q.4	**(a)**	State Laws of Friction.	**03**
	(b)	Prove with usual notation the maximum shear stress for a rectangular section is 1.5 times the average shear stress.	**04**
	(c)	A uniform ladder rests against a smooth wall as shown in the figure no.3 below. If the ladder weigh's 200N the ground has a coefficient of friction of 0.4 and a person weighing 800N start to climb up the ladder. Determine how far up the ladder they may go before the ladder starts to slip.	**07**
		OR	
Q.4	**(a)**	Explain Angle of Friction.	**03**
	(b)	Explain assumptions in theory of pure torsion.	**04**
	(c)	A hollow circular Shaft of 150mm External diameter and 100 mm internal diameter is subjected to a torque of 7.5 kN.m find Maximum shear stress and shear stress at the internal surface of the shaft. Also, calculate the angle of	**07**

twist for 2.5 m long shaft, if modulus of rigidity is 100GPa.

Q.5	**(a)**	State assumption made in the theory of pure bending.	**03**
	(b)	Explain static and kinetic friction.	**04**
	(c)	A Bar which subjected to load as shown in figure No.4. Find the total change in length of the bar and the maximum stress in the bar. If E= 200GPa. (All length and diameter in mm)	**07**

OR

Q.5	**(a)**	Explain Classification of Materials	**03**
	(b)	Define :- i) Brittleness ii) Ultimate strength iii) working stress iv) Ductility	**04**
	(c)	A mild steel bar having cross section of 20mm x 40mm and length of 500mm is subjected to an axial tensile load of 75 kN. Calculate the change in its dimensions and the volumetric strain. Take E=200 GPa and Poisson ratio of the materials, μ= 0.3	**07**

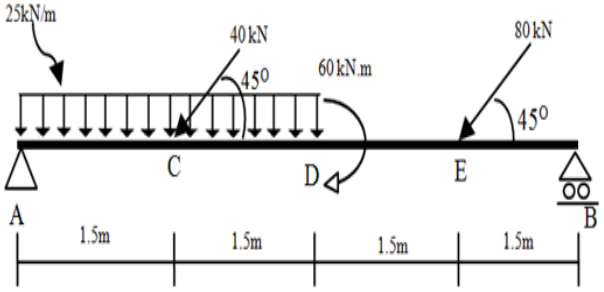

Fig No.1 for Q1(C)

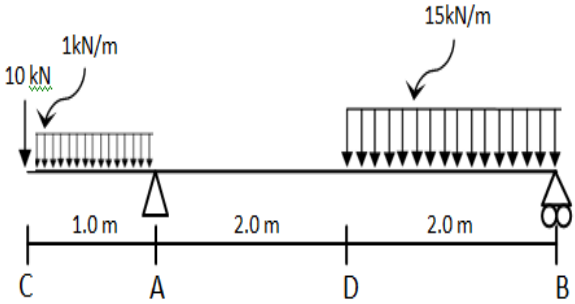

Fig No.2 for Q2 (C)

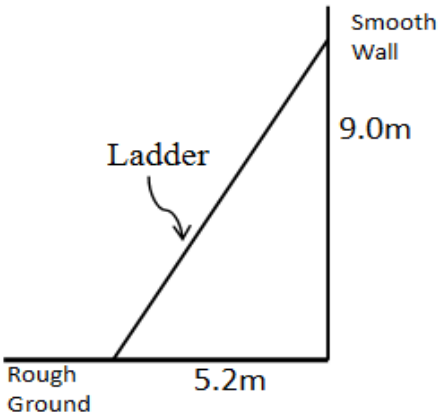

Fig No. 3 for Q4 (C)

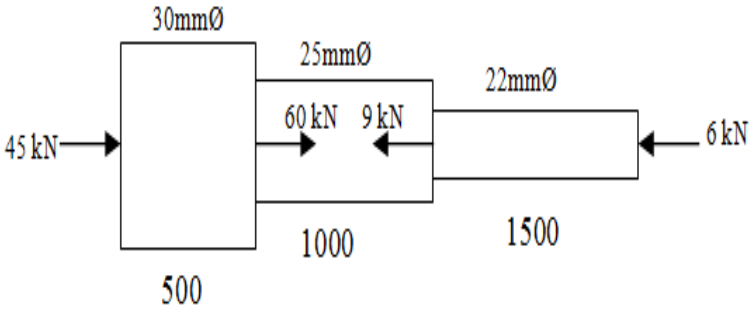

Fig No. 4 for Q5(C)

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