Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2130003 Date:18/05/2018

Subject Name:Mechanics of Solids

Time:10:30 AM to 01:00 PM Total Marks: 70

Instructions:

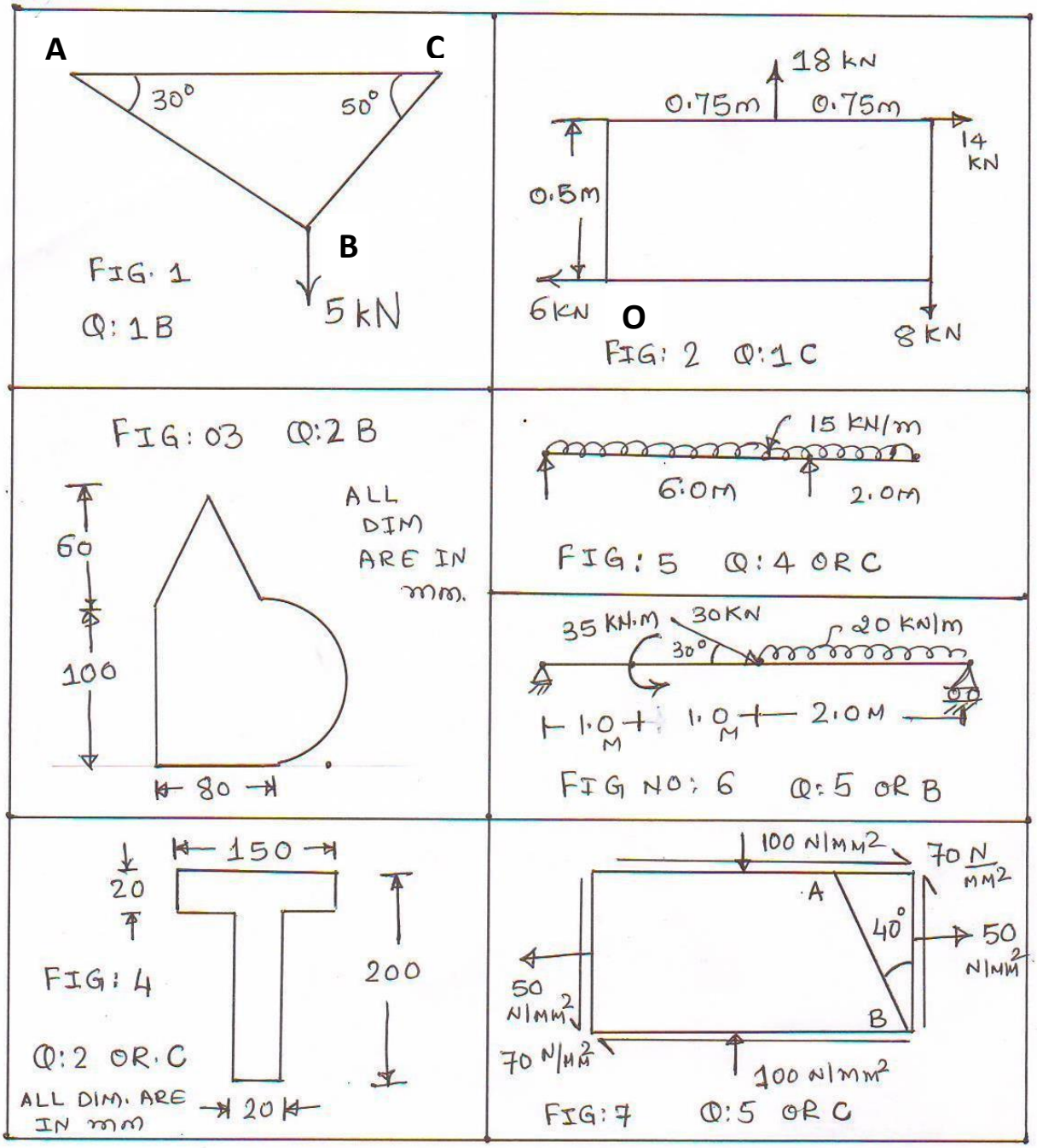
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define (i) Couple (ii) Moment (iii) Equilibrant	**3**
	(b)	State Lami's Theorem. Determine tension in wire AB and BC shown in Fig 1.	**4**
	(c)	Determine magnitude, direction and position of resultant for force system shown in fig 2. with respect to point O.	**7**
Q.2	**(a)**	State (i) Verignon's theorem and (ii) Pappus-Guldinus Theorems	**3**
	(b)	Determine C.G. of lamina shown in fig 3	**4**
	(c)	Derive equation for I_{xx} for triangular section with Base 'B' and Height 'H'	**7**
		OR	
	(c)	Determine I_{xx} and I_{yy} for section shown in fig 4	**7**
Q.3	**(a)**	Define (i) Strain (ii) Poisson's ratio (iii) Bulk Modulus	**3**
	(b)	State Hook's low. Draw stress strain curve for Mild Steel Specimen and explain each point in detail	**4**
	(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.	**7**
		OR	
Q.3	**(a)**	Define (i) Stress (ii) Young's modulus (iii) Modulus of rigidity	**3**
	(b)	Derive equation to find volumetric strain for cylindrical specimen.	**4**
	(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 $\mu = 0.3$	**7**
Q.4	**(a)**	State the assumption made in theory of bending.	**3**
	(b)	A simply supported beam 5 m in span carries udl of 20 kN/m. The croos section of beam is I section. It is having flange dimension 200 X 20 mm. The thickness of web is 20 mm, depth 260 mm and overall depth of I section is 300 mm. Calculate maximum stresses.	**4**
	(c)	A solid shaft is 100 mm in diameter, transmits 120kW at 200 rpm. Find the maximum intensity of shear stress induced and angle of twist for a length of 6 meters. Take $C = 8 \times 10^4$ N/mm^2.	**7**
		OR	
Q.4	**(a)**	Define (i) Shear Force (ii) Point of Contraflexture (iii) Neutral Axis	**3**
	(b)	A simply supported beam 6 m in span carries udl of 18 kN/m. The croos- section of beam is hollow rectangular section with outer dimension 250 X 400 mm and 25 mm thick. Determine shear stress at various locations.	**4**
	(c)	Draw shear force and bending moment for the beam shown in fig 5.	**7**
Q.5	**(a)**	Explain cone of friction with neat sketch.	**3**
	(b)	State the laws of dry friction.	**4**
	(c)	A uniform ladder of weight 250 N, and length 5 m is placed against a vertical wall in position where its inclination with vertical is 30°. A man weighing 800N climbs the ladder. At what position will he induced slipping. Take $\mu = 0.2$ at all contact surface.	**7**
		OR	

Q.5 (a) Prove that for rectangular section maximum shear stress is 1.5 time average stress **3**

(b) Find the reaction of beam shown in fig 6. **4**

(c) Determine normal and tangential stress on plane AB, in a strained material shown in fig 7. Determine the stress by Mohr's circle also. **7**



****