Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – SUMMER 2025

Subject Code:2130003 **Date:13-06-2025**

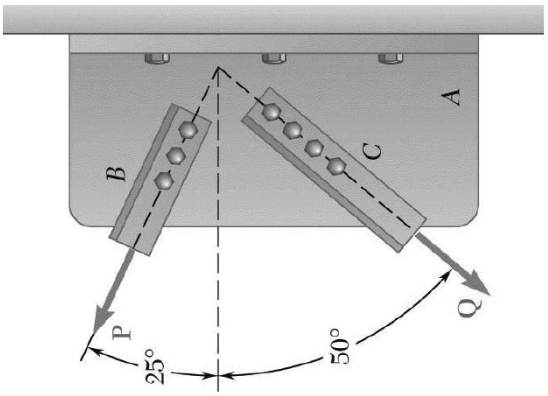
Subject Name:Mechanics of Solids

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

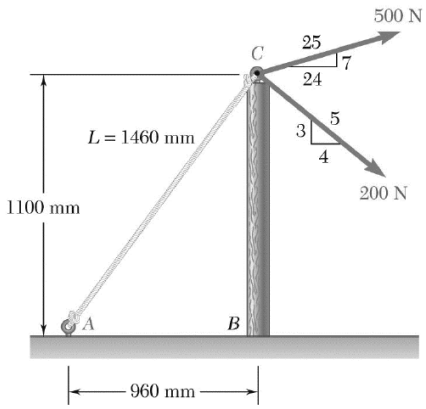
Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

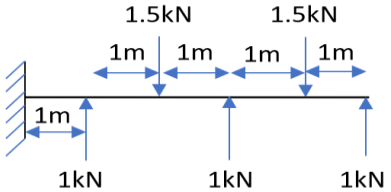
			MARKS
Q.1	**(a)**	Write Difference between Load and Force with Example	**03**
	(b)	Use law of parallelogram and solve the below example using graphical method.	**04**



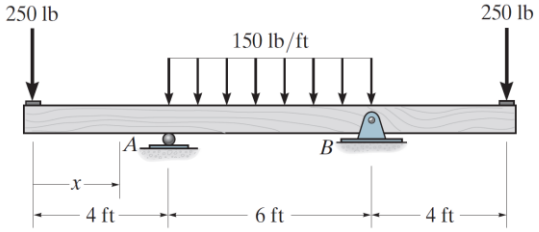
	(c)	Determine the resultant of the three forces excreted at point C of post BC, assume that Rope AC is in tension with force of 365 N	**07**



Q.2	**(a)**	Find reactions for beam given below	**03**



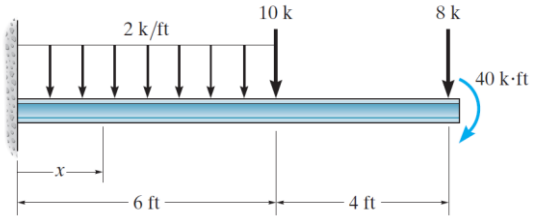
(b) Determine Support Reactions for beam given below. **04**



(c) Draw Shear force and Bending Moment Diagram for Q.2 (b) **07**

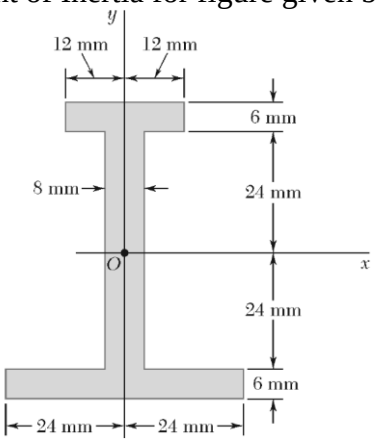
OR

(c) Draw Shear force and Bending Moment Diagram for Beam given below. **07**



Q.3 **(a)** Explain different definition of Static friction, Kinetic Friction & Angle of Repose. **03**

(b) Determine Second Moment of Inertia for figure given below. **04**



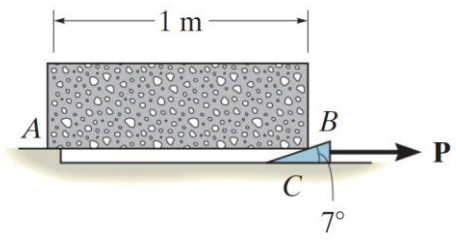
(c) Determine the static coefficient of friction if There is cargo of weight W which is start moving when trailer of the truck is raised and inclined at an angle of $\Theta = 25^{o}$. **07**

OR

Q.3 **(a)** Determine Centroid, Center of Gravity and Center of Mass **03**

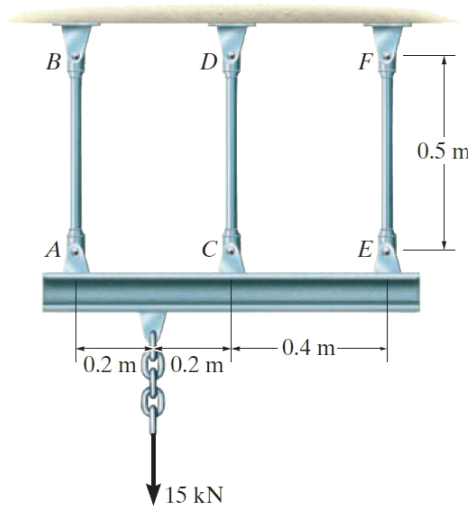
(b) Assume a concrete block of size 1m width x 1m breadth x 3m height, Locate the distance of a point at which if force is excreted than it will not overturn but starts slide only. Consider unit weight of concrete is 24 kN/m^3 and coefficient of friction is 0.5. **04**

(c) The uniform stone in Fig. given below has a mass of 500 kg and is held in the horizontal position using a wedge at *B*. If the coefficient of static friction is μ_s = 0.3 at the surfaces of contact, determine the minimum force *P* needed to remove the wedge. Assume that the stone does not slip at *A*. **07**



Q.4 **(a)** Define Shear and Complementary Shear. **03**

(b) For a figure given below determine the stress developed in it, the Bar AB & EF has cross section area of 50 mm^2 & CD has cross section area of 30 mm^2 **04**

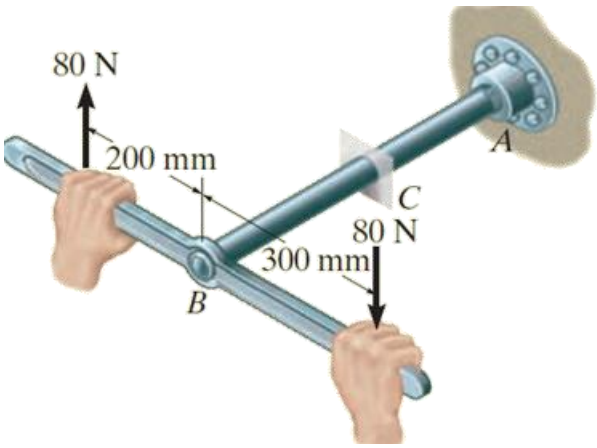


(c) There two shafts one with solid diameter 100mm and another is tube with Outer Diameter 100mm and 25mm thickness are made of a material having an allowable shear stress of 75 MPa. Determine the maximum torque that can be applied to each cross section. **07**

OR

Q.4 **(a)** For a square beam of size 50mm x 50mm made up of steel with Young Modulus E = $2x10^5$ MPa for a simply supported beam of 500mm span, calculate maximum UDL it can take with allowable bending stress of 250MPa. **03**

(b) The pipe shown in Figure below has an inner radius of 40 mm and an outer radius of 50 mm. If its end is tightened against the support at *A* using the torque wrench, determine the shear stress developed in the material at the inner and outer walls along the central portion of the pipe. **04**

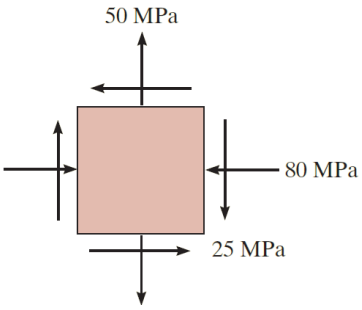


(c) Write steps to develop the Mohr's Circle of stress. **07**

Q.5 **(a)** Define Isotropic material, Homogenous Material & Bulk Modulus **03**

(b) Calculate Maximum shear force capacity of a beam having 100mm x 100mm size, if its allowable shear stress is 100MPa. **04**

(c) The state of plane stress at a point is represented on the element shown in Figure. Determine the state of stress at this point on another element oriented 30° clockwise from the position shown. **07**

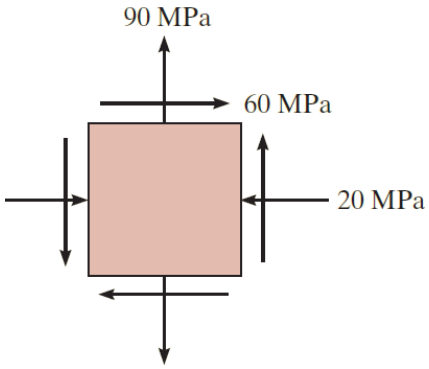


OR

Q.5 **(a)** Explain Hooke's Law with Mild Steel Stress strain curve. **03**

(b) Calculate maximum bending stress developed in a circular pipe having Outer Dia 1500mm and thickness of 20mm, if it is filled fully with water and span of 5m and simply supported condition. **04**

(c) The state of stress at a point just before failure of this shaft is shown in Figure. Represent this state of stress in terms of its principal stresses. **07**



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