JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATION- 2024
B.Tech-III Semester (CE)

COURSE CODE (CREDITS): 18B11CE315 (3) MAX. MARKS: 35
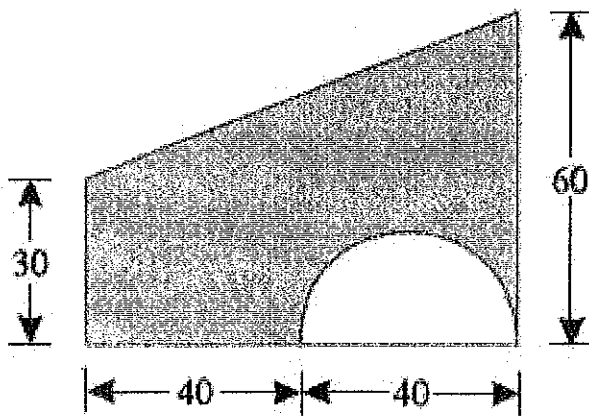COURSE NAME: ENGINEERING MECHANICS
COURSE INSTRUCTORS: DR. SAURAV MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.
(b) The candidate is allowed to make Suitable numeric assumptions wherever required
for solving problems

| Q.No	Question	CO	Marks
Q1	Find the area moment of inertia of a triangular lamina of width b and height h about an axis passing through its base from first principles. Based on the equation derived find the area moment of inertia about an axis passing through its CG and parallel to its base.	CO-3	5
Q2	A semicircular area is removed from a trapezium as shown in Fig.1 (dimensions in mm). Determine the centroid of the remaining area (shown hatched). Fig. 1	CO-3	5
Q3.	A steel rail is 12 m long and is laid at a temperature of 18°C. The maximum temperature expected is 40°C. (i) Estimate the minimum gap between two rails to be left so that the temperature stresses do not develop. (ii) Calculate the temperature stresses developed in the rails, if: (a) No expansion joint is provided. (b) If a 1.5 mm gap is provided for expansion. (iii) If the stress developed is 20 N/mm^2, what is the gap provided between the rails? Take E = 2 × 10^5 N/mm^2 and α = 12 × 10^{-6}/°C.	CO-4	6
Q4.	The system of forces acting on a bell crank is shown in Fig 2. Determine the magnitude, direction and the point of application of the resultant.	CO-1	4
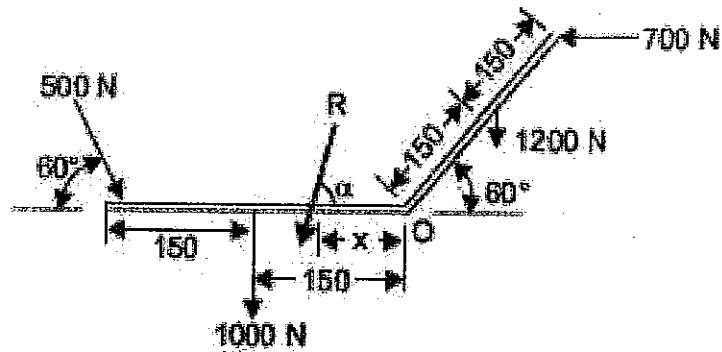
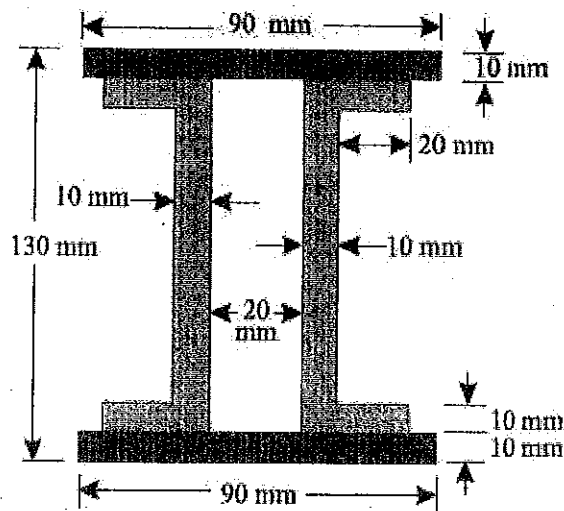|			
	 Fig. 2		
Q5.	A built up section is made by needing too stable and two channel sections as shown in Fig. 3. **Determine center of gravity** of the built up section and **moment of inertia** of a built up section about X-X axis passing through top most fiber **Fig. 3**	CO-3	5
Q6.	Write Short Notes i) State and explain Varignon's theorem of moments. ii) Define a couple-moment and list its characteristics iii) Draw a typical stress-strain curve for mild steel, indicate salient point and define them iv) A tapering rod has diameter d_1 at one end and it tapers uniformly to a diameter d_2 at the other end in a length L. If the modulus of elasticity is E, find the change in length when subjected to an axial force P. v) Explain Parallel axis theorem using an example	CO-1-CO4	10