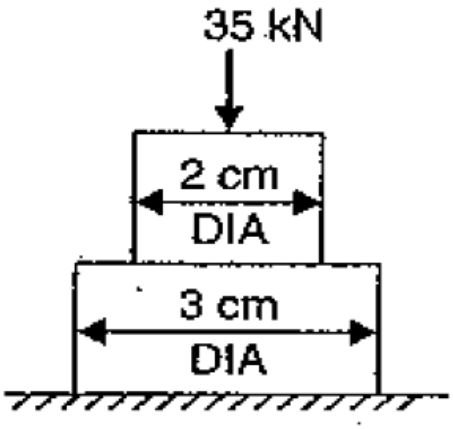
Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2023

Course: Strength of materials **Semester: IV**
Program: B.Tech Mechanical and ADE **Time: 03 hrs.**
Course Code: MECH 2012 **Max. Marks: 100**

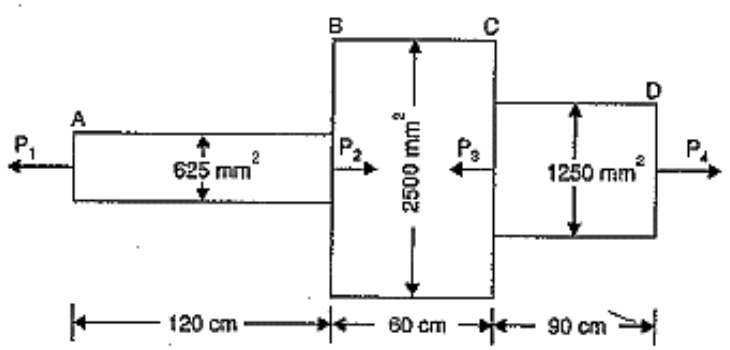
Instructions: Attempt all the questions. Assume suitable data if missing.

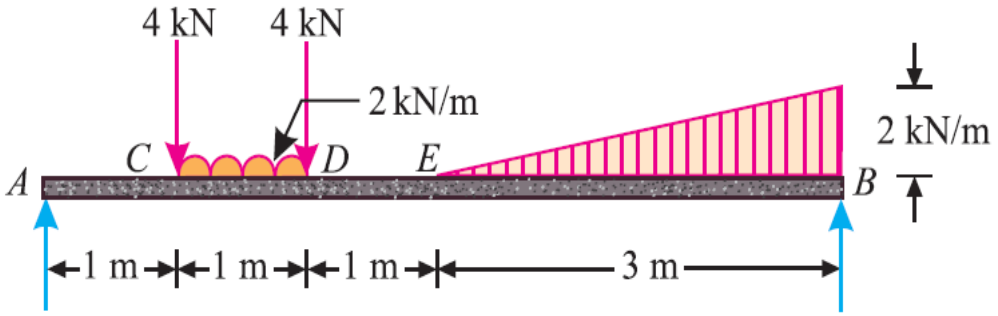
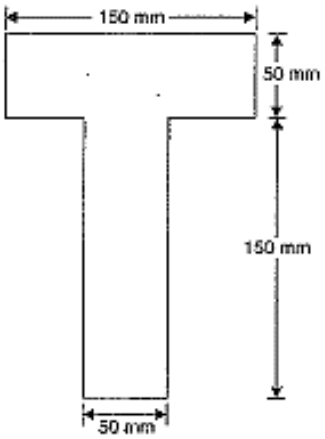
SECTION A
(5Qx4M=20Marks)

Q No	Statement	Marks	CO
Q 1	A stepped bar as shown in figure is subjected to an axially applied load of 35 kN. Find the ratio of maximum and minimum stresses produced. 	**4**	**CO1**
Q 2	Derive an expression of elongation in a conical rod hung upside down due to self-weight. Take the usual notations.	**4**	**CO1**
Q 3	Enlist the assumption made in deducing the equation for shear stress produced in a circular shaft subjected to torsion.	**4**	**CO1**
Q 4	Differentiate thin cylinder with thick cylinder on the basis of dimensional attributes and stresses developed.	**4**	**CO1**
Q 5	Discuss the analysis of shaft in series and parallel, subjected to pure torsional moments.	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in figure. Calculate the force necessary P_2 for equilibrium of the member, assuming P_1 = 45	**10**	**CO2**

	kN, P_3= 450 kN and P_4 = 130 kN. Determine the total elongation of the member, assuming the modulus of elasticity to be 2.1 x 10^5 N/mm^2.  		
Q 7	Derive an expression for longitudinal and circumferential stresses developed in a thin cylinder of thickness t and internal diameter d, which is subjected to an internal pressure P.	**10**	**CO2**
Q 8	The shear force acting on a beam of rectangular cross-section at a point is F. Show that the maximum shear stress developed is 1.5 times the average shear stress.	**10**	**CO3**
Q 9	Compare the torsional strength of a circular solid shaft with hollow shaft whose internal diameter is 2/3 of the outside diameter of same weight, same material, same length and same angle of twist. OR Two shafts of the same material and same lengths are subjected to the same torque. If the first shaft is of a solid circular section with 50 mm diameter and the second shaft is of hollow circular section, whose internal diameter is 3/4 of the outside diameter and the maximum shear stress developed in each shaft is the same, compare the weights of the shafts.	**10**	**CO3**
SECTION-C (2Qx20M=40 Marks)			
Q 10	Draw the shear force and bending moment diagram for the beam loaded as shown in figure.	**20**	**CO3**

			
Q 11	A beam is of T-section as shown in figure. The beam is simply supported over a span of 4 m and carries a uniformly distributed load of 2 kN/m run over the entire span. Determine the maximum tensile and maximum compressive stress.  OR A beam of length 20 m is simply supported at the ends and carries two point loads 4 kN and 10 kN at a distance of 8 m and 12 m from left respectively. Calculate; a. Deflection under each load and b. Maximum deflection.	**20**	**CO4**