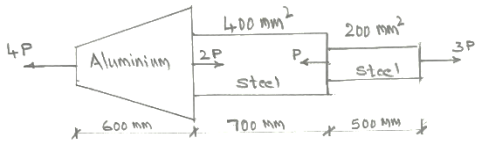
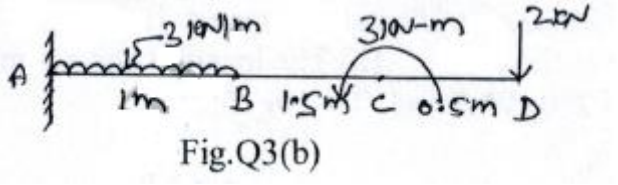
	Model Question Paper-1/2 with effect from 2022-23 (CBCS 2022 Scheme)
USN	

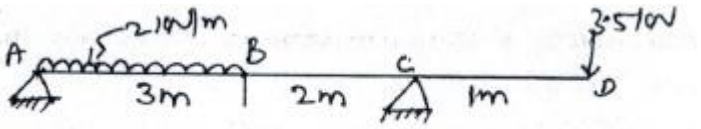
Third Semester Civil Engineering B.E. Degree Examination

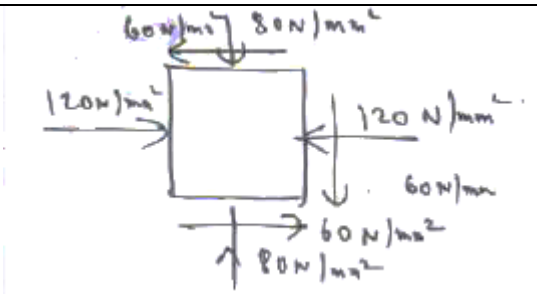
Strength of Materials

TIME: 03 Hours **Max. Marks: 100**

Note: 01 Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	***Bloom's Taxonomy Level**	**COs**	**Marks**
Q.01	a	Derive the expression for extension of rectangular tapering bar subjected to an axial load P	L3	1	07
	b	Explain the terms: (i) Modulus of Elasticity (ii) Modulus of rigidity (iii) Poisson's ratio	L1	1	03
	c	A round bar with stepped portion is subjected to the forces as shown in Fig. Q1(c). Determine the magnitude of force P, such that the net deformation in the bar does not exceed 1 mm. E for steel is 200 GPa, E for Aluminum is 70 GPa. Large end diameter and small end diameter of the tapering bar are 40 mm and 12.5 mm respectively.  	L3	1	10
		OR			
Q.02	a	Derive an expression for circular tapering bar	L3	1	10
	b	A 18 mm diameter steel rod passes centrally through a copper tube of 26 mm diameter (internal) and 38 mm external diameter. The rod is 2.6 m long and is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly on the protecting parts of the rod. If the temperature of assembly is raised by 80^0C, calculate thermal stresses induced in copper and steel. Take α_{cu}= 17.5X10^{-6}/^{0}C, α_s= 12X10^{-6}/^{0}C, E_{st}= 210 GPa, E_{cu}= 1.05X10^5 N/mm^2.	L2	1	10
		Module-2			
Q. 03	a	What are the different types of loads and supports? Explain with a neat sketch?	L1	2	08
	b	Draw BMD and SFD for the beam shown in Fig 3(b).  Fig.Q3(b)	L2	2	12
		OR			
Q.04	a	Derive the relationship between load, shear force and bending moment	L2	2	06

	b	Draw BMD and SFD for the beam shown in Fig. 4(b). Indicate the maximum bending moment and its location. Also show the point of contra flexure.  Fig.Q4(b)	L2	2	14
	c				
		Module-3			
Q. 05	a	What are the assumptions of simple bending?	L1	3	05
	b	Derive the Bernoulli's equation for bending stress	L2	3	10
	c	A rectangular beam 250 mm depth and 150 mm width is simply supported with a span of 8 m. What UDL per meter the beam can carry if the bending stress is not to exceed 140 N/mm^2	L2	3	05
		OR			
Q. 06	a	Derive an expression for shear stress?	L2	3	10
	b	A beam with an I-section consists of 180x15 mm flanges and curb of 280 mm depth and 15 mm thickness. It is subjected to a bending moment of 120 kN-m and shear force of 60 kN. Sketch the bending stress and shear stress distribution along the depth of section ?	L2	3	10
		Module-4			
Q. 07	a	Derive the relationship between slope, deflection and radius of curvature?	L2	4	10
	b	A simply supported beam spanning 8 m carries a concentrated loads of 60 kN and 30 kN at distances of 2 m and 4 m from left support. Determine (i) the slope at the ends (ii) The location and magnitude of maximum deflection Assume E = 200 GPa and I = $20x10^8$ mm^4	L3	4	10
		OR			
Q. 08	a	Differentiate between short and long column	L1	4	4
	b	Describe the limitation of Euler's theory	L1	4	4
	c	Find Euler's load for a column 40 mm x 50 mm C/S and 2 m long, if one of its end is fixed and other end is hinged. E for the material of the column is 200 N/mm^2. Find Rankine's load in the above case, if the yield stress in compression is 320 N/mm^2, $\alpha = 1/7500$	L3	4	12
		Module-5			
Q. 09	a	Show that the planes of maximum shear stresses are inclined at 45^0 with the principal planes	L2	5	06
	b	The state of stress in a two-dimensionally stressed body is shown in Fig. Q9(b). Determine the principal planes, principal stresses, maximum shear stress and their planes.	L2	5	14

		 Fig. Q9(b).			
OR					
Q. 10	a	Show that in a thin cylinder the hoop stress is twice the longitudinal stress	L3	5	08
	b	What area the assumptions made in Lame's equation? Derive Lame's equation	L2	5	12