Total No. of Printed Pages:2

PRN No.	

PAPER CODE	U213-222(RE)

December 2023 (REEXAM)

SY / (SEMESTER - I)

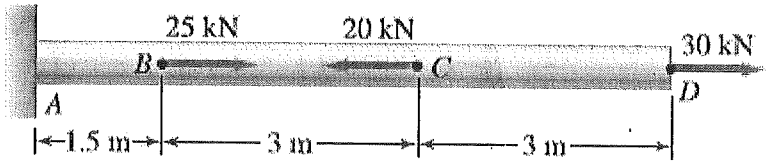
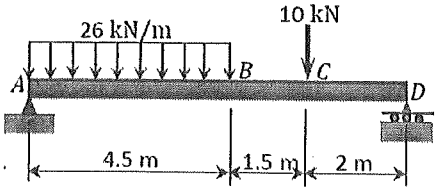
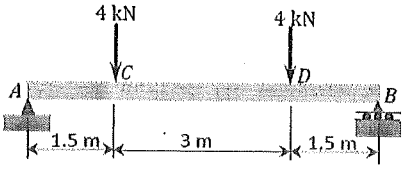
COURSE NAME: Mechanics of Solids I Branch: Civil COURSE CODE: ES21202CV

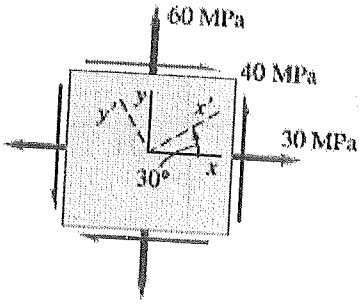
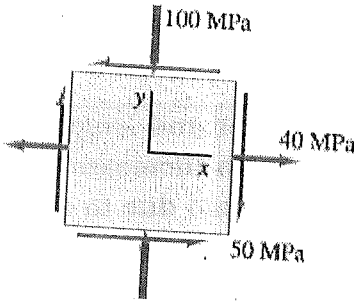
(PATTERN 2020)

Time: [2 Hrs] **[Max. Marks: 60]**

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any two sub questions each from each Question 1 ,2, 3,4,5,and 6 respectively**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) A circular rod of 30 mm diameter and length 200 mm is subjected to tensile load. The length increases by 0.09 mm and diameter decreases by 0.0045 mm due to application of a tensile force. Determine its Poisson's ratio	[5]	CO1	Understand
	b) The cross-sectional area of bar ABCD shown in Fig 1 is 600 mm2. Determine the maximum normal stress in the bar.  Fig 1	[5]	CO1	Apply
	c) An 18-m-long steel wire of 5-mm diameter is to be used in the manufacture of a pre-stressed concrete beam. It is observed that the wire stretches 45 mm when a tensile force P is applied. Knowing that E = 200 GPa, determine (a) the magnitude of the force P, (b) the corresponding normal stress in the wire.	[5]	CO1	Understand
Q2	a) Draw SFD & BMD for the beam shown in Fig2  Fig 2  Fig 3	[5]	CO2	Apply
	b) Draw SFD & BMD for the beam shown in Fig3	[5]	CO2	Apply

	c) Draw SFD & BMD for a cantilever beam carrying a uniformly distributed load w (downward) over the span L	[5]	CO2	Apply
Q3.	a) A steel cantilever beam 5 m in length is subjected to a concentrated load of 1 kN acting at the free end of the bar. The beam is of rectangular cross section, 50 mm wide by 75 mm deep. Determine maximum bending stress & shear stress induced in the beam.	[5]	CO3	Apply
	b) Enlist the assumptions in theory of pure bending	[5]	CO3	Remember
	c) Draw representative bending stress & shear stress distribution diagram for 'T' AND 'I' section	[5]	CO3	Remember
Q.4	a) The state of plane stress at a point with respect to the xy-axes is shown in Fig4. Determine the equivalent state of stress with respect to the x-y-axes. Show the results on a sketch of an element aligned with the x- y-axes.	[5]	CO4	Apply
	 Fig 4			
	 Fig 5			
	b) For the state of plane stress shown in Fig 5, determine (*a*) the principal planes, (*b*) the principal stresses, (*c*) the maximum shearing stress and the corresponding normal stress.	[5]	CO4	Apply
	c) Solve above problem (4-b) using Mohr's Circle concept	[5]	CO4	Apply
Q.5	a) State the Rankin's Formula for column and explain each term in it	[5]	CO5	Remember
	b) Determine the Euler's critical load of a steel tube that is 5 m long fixed at both ends and has a 100-mm outer diameter and a 16-mm wall thickness. Use $E = 200$ GPa.	[5]	CO5	Apply
	c) Determine the kern (core) distances for i) Square section of 150 mm side ii) Circular section of diameter 150mm	[5]	CO5	Remember
Q.6)	a) State the torsion formula and explain the meaning of each term involved in this.	[5]	CO6	Remember
	b) A prismatic timber beam subjected to two concentrated loads of equal magnitude as shown in Fig 3 (2-b). Using Macaulay's method determine slope at A and deflection at C	[5]	CO6	Analyze
	c) Determine slope and deflection at free end for a 6m span cantilever beam shown subjected to point load of 25KN at free end	[5]	CO6	Analyze