Code: 22MEMD1T1

I M.Tech - I Semester – Regular Examinations - MARCH - 2023

ADVANCED MECHANICS OF SOLIDS
(MACHINE DESIGN)

Duration: 3 hours   Max. Marks: 60

Note: 1. This paper contains 4 questions from 4 units of Syllabus. Each unit carries 15 marks and have an internal choice of Questions.

2. All parts of Question must be answered in one place.

BL – Blooms Level   CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	At a point P, the rectangular stress components are (in kPa) $\sigma_{xx} = 1, \sigma_{yy} = -2, \sigma_{zz} = 4$ $\tau_{xy} = 2, \tau_{xy} = -3, \tau_{xy} = 1,$ Find the principal stresses and check for invariance.	L2	CO1	10 M
	b)	Define stress at a point and derive differential equation of equilibrium.	L2	CO1	5 M
		OR			
2	a)	Explain maximum principle stress criterion.	L2	CO1	7 M
	b)	Explain maximum strain energy criterion.	L2	CO1	8 M
		UNIT-II			
3		Determine the diameter d of a circular shaft subjected to a bending moment M and a torque T, according to the several theories of failure. Use a factor of safety N.	L3	CO2	15 M
		OR			

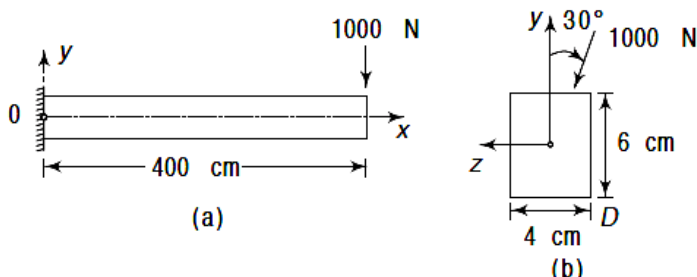| 4	a)	Explain the principle of stationary potential energy.	L3	CO2	5 M
	b)	Using Castigliano's theorem find the deflection of given simply supported beam. E= 11 GPa and I = 1.786×10^{-5} m^4	L3	CO2	10 M
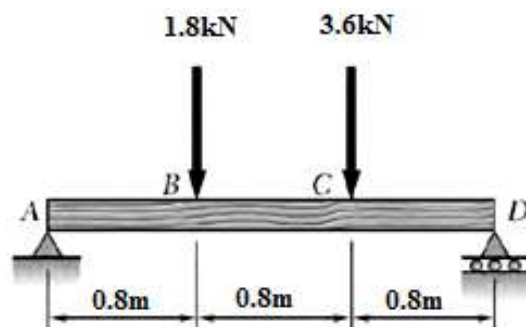
UNIT-III

5	Determine the location of shear centre for the channel section shown in Figure below.	L3	CO3	15 M
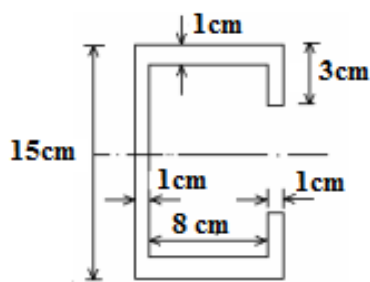
OR

6	A cantilever beam of rectangular section is subjected to a load of 1000 N (102 kgf) which is inclined at an angle of 30° to the vertical. What is the stress due to bending at point D near the built-in-end?	L3	CO3	15 M

		UNIT-IV			
7		A Steel disc of uniform thickness and of diameter 900mm is rotating about its axis at 3000 rpm. Determine the radial and circumferential stresses at the centre and outer radius. The density of the material is 7800 kg/m^3 and Poisson's ratio is 0.3.	L3	CO4	15 M
		OR			
8	a)	State the assumptions and limitations in Winkler Bach theory for curved beams.	L3	CO4	5 M
	b)	Find the load carrying capacity of a hook of rectangular cross section 100x75mm. The thickness of hook is 75mm, the radius of inner fiber is 150 mm while that of outer fiber is 250mm. The line of action of force passes at a distance of 75 mm from the inner fibers. The allowable stress is 70 N/mm^2.	L3	CO4	10 M