

PRAGATI ENGINEERING COLLEGE: SURAMPalem
(AUTONOMOUS)

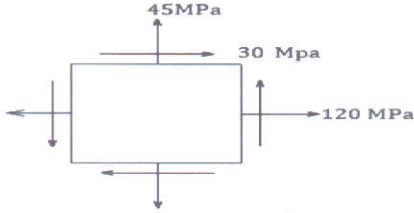
II B.Tech I Semesters Supplementary Examinations, June - 2024

SOLID MECHANICS
(CE)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks

Q. No.	Questions	BTL	CO	Marks
UNIT – I				
1.	<p>a) An element in a plane is subjected to stresses as shown in fig. Determine (i) The magnitude of the principal stresses and the orientation of principal planes (ii) Find the magnitude of maximum shear stress.</p> 	K3	CO1	7M
	<p>b) At a point in an elastic material under strain, there are normal tensile stresses of 50 N/mm² and 30 N/mm² respectively at right angles to each other with a shearing stress of 25 N/mm². Find the principle planes and principle stresses. Also calculate maximum shear stress. Use Mohr's circle approach.</p>	K3	CO1	7M
OR				
2.	<p>a) The load on a bolt consists of an axial pull of 15kN together with a transverse shear of 7.5kN. Determine the diameter of the bolt according to (i) Maximum principal stress theory (ii) Maximum strain theory. Elastic limit in tension is 285 N/mm² and a factor of safety of 3 is applied. Poisson's ratio = 0.3.</p>	K3	CO1	7M
	<p>b) A mild steel shaft 120mm diameter is subjected to a maximum torque of 20kNm and a maximum bending moment of 12kNm at a particular section. Find the factor of safety according to the maximum shear stress theory if the elastic limit in simple tension is 220MN/m².</p>	K3	CO1	7M
UNIT – II				
3.	Design a hollow steel shaft to transmit 100 kW at 150 rpm. The shear stress is limited to 60 N/mm ² and the angle of twist is not to exceed 1.25° in 3 m length of shaft. Assume the internal diameter is 0.75 times the external diameter. Take C = 0.8 x 10 ⁵ N/mm ² .	K4	CO2	14M
OR				
4.	An open coiled steel helical spring has 10 coils of 75 mm mean diameter and the diameter of the wire is 12 mm. The angle of the helix is 22°. Determine the load that would cause deformation of 30 mm in the spring and the corresponding bending and shear stresses developed in the spring.	K3	CO2	14M

UNIT – III

5.	a)	Derive the expression for Euler's crippling load for a column when both ends are fixed.	K3	CO3	7M
	b)	An I- section $400 \text{ mm} \times 200 \text{ mm} \times 10 \text{ mm}$ and 6 m long is used as a strut with both ends fixed. Find Euler's crippling load. Take Young's modulus of material of section as 200 kN/mm^2 .	K3	CO3	7M

OR

6.		A masonry dam, trapezoidal in cross section 4 m high, 1 m wide at its top and 3 m wide at its bottom, retains water on its vertical face to a maximum height of 3.5 m from its base. Determine the maximum stress at the base when the reservoir is full. Take the unit weight of masonry as 19.62 kN/m^3 .	K3	CO3	14M
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UNIT – IV

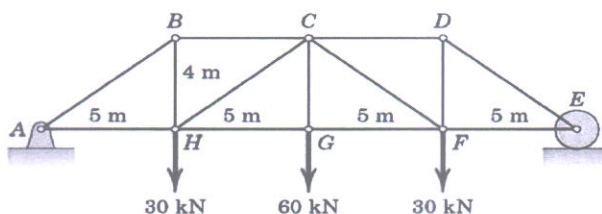
7.	a)	State the reasons for unsymmetrical bending and Discuss about the deflection of beams in unsymmetrical bending.	K2	CO4	7M
	b)	A beam of T-section (flange: $60 \text{ mm} \times 10 \text{ mm}$, web $100 \text{ mm} \times 5 \text{ mm}$) is 3 m length and is simply supported at the ends. It carries a load of 4 kN inclined at 20° to the vertical and passing through the centroid of section. If $E = 200 \text{ GN/m}^2$, calculate the maximum tensile stress.	K3	CO4	7M

OR

8.	a)	Determine the location for the shear center of a symmetrical channel section of top and bottom width as 'b' total height 'h' and thickness as 't' mm.	K2	CO4	7M
	b)	Define the shear centre. Diagrammatically represent the location of shear centre for symmetrical rectangular and I sections.	K2	CO4	7M

UNIT – V

9.		Determine the force in each member of the loaded truss by Method of Joints.	K3	CO5	14M
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OR

10.		Determine the force in each member of the loaded truss by Method of Joints.	K3	CO5	14M
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