Q.P. Code: 20CE0164 **R20**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech II Year I Semester Regular & Supplementary Examinations March-2023

MECHANICS OF SOLIDS

(Common to ME & AGE)

Time: 3 hours Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

1		Determine the diameter of a bolt which is subjected to an axial pull of 9 KN together with a transverse shear force of 4.5 KN using : (i) Maximum principal stress theory. (ii) Maximum principal strain theory. (iii) Maximum shear stress theory. (iv) Maximum strain energy theory. Given the elastic limit in tension = 225 N/mm^2, factor of safety = 3 and Poisson's ratio = 0.3.	CO1	L3	12M

OR

2	a	Draw and explain Stress-strain curve for a mild steel bar.	CO1	L1	6M
	b	Explain maximum shear strain energy theory.	CO1	L2	6M

UNIT-II

3	a	Derive the simple bending equation.	CO3	L2	6M
	b	A beam is simply supported and carries a uniformly distributed load of 40 KN/m run over the whole span. The section of the hewn is rectangular having depth as 500 mm. If the maximum stress in the material of the beam is 120 N/mm^{2}and moment of inertia of the section is 7 x 10^8 mm^4, find the span of the beam.	CO3	L3	6M

OR

4	a	Derive section modulus for rectangular section.	CO3	L2	4M
	b	A beam 500 mm deep of a symmetrical section has I = 1 x 10^8 mm^4 and is simply supported over a span of 10 m. Calculate: (i) The uniformly distributed load it may carry if the maximum bending stress is not to exceed150 N/mm^2. (ii) The bending stress if the beam carries a central point load of 25 KN.	CO3	L3	8M

UNIT-III

5	a	Derive shear stress distribution formula for rectangular section with a neat sketch.	CO3	L1	6M
	b	A timber beam of rectangular section is simply supported at the ends and carries a point load at the centre of the beam. The maximum bending stress is 12 N/mm^2 and maximum shearing stress is 1 N/mm^2, find the ratio of the span to the depth.	CO3	L3	6M

OR

6	a	State the difference between twisting moment and bending moment.	CO3	L1	6M
	b	A solid steel shaft has to transmit 75 KW at 200 r.p.m. Taking allowable shear stress as 70 N/mm^2, find suitable diameter for the shaft, if the maximum torque transmitted at each revolution exceeds the mean by 30%.	CO3	L3	6M

UNIT-IV

7	a	Write the assumptions made in the Euler's column theory.	CO5	L2	4M
	b	Write the end conditions for long columns and state the difference between long Columns and short columns.	CO5	L2	8M

OR

8		A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a uniformly distributed load of 9 KN/m run over the entire span of 5 m. If the value of E for the beam material is 1 x 10^4 N/mm^2, find : (i) The slope at the supports and (ii) Maximum deflection.	CO4	L3	12M

UNIT-V

9	a	Derive expression for circumferential stress in thin cylinder.	CO6	L2	6M
	b	A cylindrical pipe of diameter 1.5m and thickness 1.5cm is subjected to an internal fluid pressure of 1.2 N/mm^2. Determine: i) Longitudinal stress developed in the pipe, and ii) Circumferential stress developed in the pipe.	CO6	L3	6M

OR

10	a	A cylinder of thickness 1.5cm has to withstand maximum internal pressure of 1.5N/mm^2. If the ultimate tensile stress in the material of the cylinder is 300N/mm^2, factor of safety 3.0 and joint efficiency 80%, determine the diameter of the cylinder.	CO6	L3	6M
	b	A spherical shell of internal diameter 0.9m and of thickness 10mm is subjected to an internal pressure of 1.4 N/mm^2. Determine the increase in diameter and increase in volume. Take E=2X10^5 N/mm^2 and μ=1/3.	CO6	L3	6M

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