



R20 Regulation

Subject code: 3P3CF

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech III Semester Supplementary Examinations, February 2024

MECHANICS OF SOLIDS

(ME)

Maximum Marks: 70

Date: 28.02.2024 Duration: 3 hours

- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

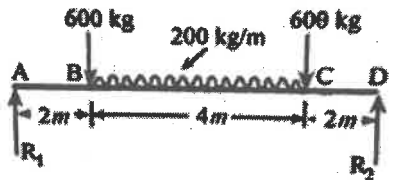
Part-A

All the following questions carry equal marks (10X2M=20 Marks)		CO	Bloom Tx
1	State and explain hook's law.	1	L1
2	Explain about Gradual, sudden and shock loadings?	1	L2
3	Define beam? Write about the types of beams?	2	L1
4	Define shear force and bending moment.	2	L1
5	Mention the assumptions in the theory of simple bending.	3	L2
6	Draw the Shear stress diagram for I- section.	3	L2
7	Explain about Mohr's theorem?	4	L1
8	What is Tresca's theory.	4	L1
9	Differentiate hoop & longitudinal stress.	5	L2
10	Write torsion formulae and discuss significance of all parameters.	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)

11	(a) Construct stress strain diagram for structural steel and locate various important salient points on that.	7M	1	L2
	(b) Write all the relations relating the elastic constants?	3M		L1
OR				
12	The following data pertains to a tension test conducted in a laboratory. Diameter of the specimen = 15 mm Length of the specimen = 200 mm Extension under a load of 10 kN = 0.035 mm Load at yield point = 110 kN Maximum load = 190 kN Length of specimen after failure = 255 mm Neck diameter = 12.25 mm Determine: (i) Young's Modulus (ii) Yield stress (iii) Ultimate stress (iv) Percentage elongation (v) Percentage reduction in area (vi) Safe stress using a factor of safety of 1.5.	10M	1	L3

13	A simply supported beam of length 5m carries a uniformly increasing load of 800N/m run at one end to 1600N/m run at the other end. Draw the shear force and bending moment diagrams for the beam. Also evaluate the position and magnitude of maximum bending moment.	10M	2	L2
OR				
14	Draw the Shear force and bending moment diagram for the loaded beam as shown in figure. 	10M	2	L3
15	A 61cm × 19cm I-joist has 2.7cm thick flanges and 1.5cm thick web. Calculate the maximum intensity of shear stress and sketch the distribution of stress across the section, the S.F. at the cross-section being 600kN.	10M	3	L3
OR				
16	A hollow circular section of outside diameter 150 mm and 15 mm thick carries a shear force of 30 kN. Determine the maximum shear stress and the shear stress at the inner edge and draw the shear stress distribution diagram.	10M	3	L4
17	An element in a structure is subjected to a plane stress system that has the stress values $\sigma_x=100$ MPa, $\sigma_y=140$ MPa and $\tau_{xy}= 50$ MPa. Draw a Mohr's circle and find (i) principal stresses and principal directions (ii) the maximum shear stress and the accompanying normal stress.	10M	4	L4
OR				
18	(a) Write short notes on Von Mises Theory. (b) A bolt is subjected to an axial pull of 9 kN and a transverse shear of 4.5 kN. Determine the diameter of the bolt if the elastic limit in tension is 225 MPa using maximum principal stress theory and the maximum shear stress theory. Assume a factor of safety of 3.	4M 6M	4	L2 L3
19	(a) State the assumptions made in the theory of torsion. (b) A solid steel shaft of an automobile axle is required to transmit a torque of 20 kN-m. If the shear stress is not to exceed 70 N/mm ² and the angle of twist is limited to 0.2 degree per meter, find a suitable diameter for the shaft. Given $G=84$ Gpa.	4M 6M	5	L2 L3
OR				
20	A cylindrical vessel is 1.6m diameter and 5m long is closed at ends by rivets. It is subjected to an internal pressure of 4N/mm ² . If the maximum principal stress is not to exceed 120 N/mm ² , find the thickness of the shell. Assume $E = 2 \times 10^5$ N/mm ² and Poisson's ratio = 0.25. Find the change in diameter, length and volume of the shell.	10M	5	L4