Hall Ticket Number:

Code No. : 13566 N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (Mech. Engg.) III-Semester Main & Backlog Examinations, Jan./Feb.-2024

Mechanics of Materials

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	A mild steel rod 16 mm diameter and 2200 mm long is subjected to an axial pull of 27 KN. If E= 200GPa, calculate the elongation of bar.	2	2	1	1
2.	What is the difference between shear strain and Normal strain acting on a body.	2	1	1	1
3.	What is the relationship between Load ' W', Shear force 'F' and Bending moment ' M' in the construction of SF and BM diagrams.	2	1	2	2
4.	Draw the SF and BM diagram for a cantilever beam subjected to point Load "W" at the free end.	2	1	2	1
5.	Calculate the section modulus for a rectangular beam of width 15mm and depth 10 mm.	2	1	3	2
6.	Sketch the shear stress distribution curve for a circular beam of diameter " d " subjected to shear force F.	2	1	3	1
7.	A cast iron beam 40 mm wide and 80 mm deep is simply supported on a span of 1.2 m. The beam carries a point load of 15 KN at the centre. Find the deflection at the centre. Take E= 108000 N/mm^2.	2	2	4	3
8.	What are the maximum slope and maximum deflection values for a simply supported beam subjected to UDL of 'w' N/m for entire length 'l'.	2	1	4	1
9.	What are the Lame's Equations to find the hoops stress, radial pressure and Longitudinal stress in Thick cylinders.	2	1	5	2
10.	A seam less pipe 800 mm diameter contains fluid under a pressure of 4 N/mm^2. If the pernissible tensile stress be 150 N/mm^2, find the minimum thickness of pipe.	2	2	5	3
	Part-B (5×8 = 40 Marks)				
11. a)	A steel rod 100 mm in diameter is subjected to an axial tensile force of 600 KN. If E= 200 GPa and poisson's ratio =0.29, determine the percentage change in diameter after the load is applied.	4	3	1	2
b)	Derive an equation to determine volumetric strain of (i) cuboid of length 'l', width 'b', height 'h'. (ii) cylinder of diameter d and height 'h'.	4	2	1	1

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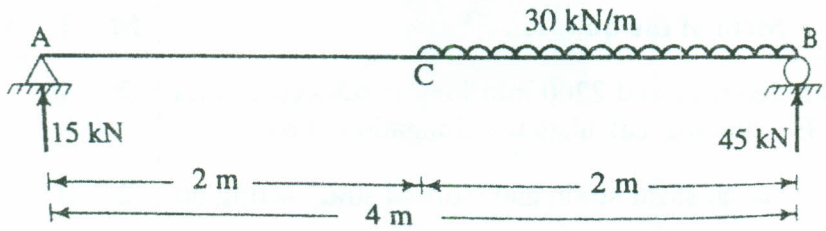
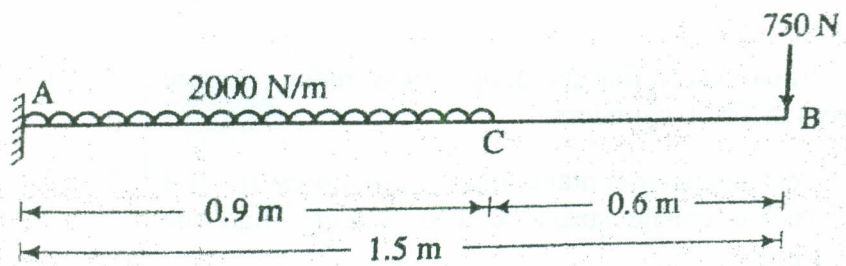
12. a)	Construct the shear force and bending moment diagrams for a simply supported beam subjected to UDL of "w" N/m for entire length "l" of the beam.	4	2	2	3
b)	A simply supported beam AB of 4 metres span carries a uniform load of 30 KN/m over the right hand half of the span as shown in Fig.1.Construct the SF and BM diagrams.  Fig-1	4	3	2	3
13. a)	A beam of symmetrical section, depth =400 mm, I= 193 x 10^6 mm^4 is simply supported over a span of 8 metres. What uniformly distributed load 'w' may it carry if the maximum bending stress is not to exceed 120 MPa. What concentrated load may be carried by the beam at the centre with the same permissible bending stress?	4	4	3	3
b)	A rectangular beam section 150 mm wide x 300 mm depth is subjected to shear force of 20 KN. Determine the average shear stress and maximum shear stress developed in the beam and sketch the shear stress distribution curve.	4	3	3	2
14. a)	A cantilever beam 1.5 metres long is loaded with a point load of 750 kN at the free end and a uniformly distributed load 2000 N/m over 0.9 m from the fixed end as shown in Fig-2. If the section is rectangular of width 75 mm and 150 mm deep, Calculate the maximum slope and maximum deflection at the free end . Take E= 0.11x 10^5 N/mm^2.  Fig-2	4	4	4	2
b)	A cantilever 5 metres long carries a load of 10 KN at the free end and 30 KN at the middle. Calculate the maximum slope and maximum deflection at the free end. Take E= 2.1x 10^5 N/mm^2 and I= 15650 cm^4.	4	3	4	3
15. a)	A mild steel tube 4 metres long, 30 mm internal diameter and 4 mm thick is used as a coloumn with both ends fixed. Find the collapsing load. Take E= 2.1x 10^5 N/mm^2.	4	3	5	2

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b)	A shaft transmits 50 KW at speed of 3600 rpm. Find the diameter of the shaft if the shear stress is not to exceed 75 N/mm^2.	4	3	5	2
16. a)	Determine the tensile force on steel bar circular cross section, 25 mm diameter, if the strain is equal to 0.75 x 10^{-3}. Consider E for steel = 2 x 10^5MPa.	4	2	1	3
b)	Draw the Shear force and Bending moment diagrams for a cantilever beam of length 10 metres subjected to UDL of 5 N/m for the entire length.	4	2	2	3
17.	Answer any ***two*** of the following:				
a)	Derive the equation $\frac{M}{I} = \frac{\sigma_b}{y} = \frac{E}{R}$ in bending stress of beams.	4	3	3	2
b)	A beam 6 m long is simply supported at its end is carrying a point load "w" at its mid span. If the slope at the end is not to exceed 2 degrees, then calculate the deflection at the mid span.	4	4	4	3
c)	Find the torque that a 75 mm diameter wooden shaft can resist if the permissible shear stress is 2 MPa.	4	2	5	2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	18%
ii)	Blooms Taxonomy Level – 2	34%
iii)	Blooms Taxonomy Level – 3 & 4	48%

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