Register No : _____

# THE KAVERY ENGINEERING COLLEGE

*(An Autonomous Institution)*

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

*Fourth Semester*

*Mechanical Engineering*

CE3491-Strength of Materials

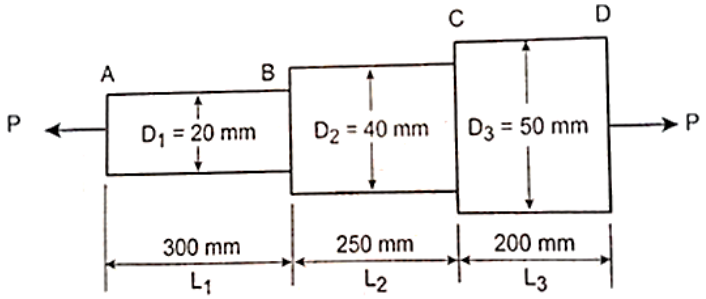
*Regulations – 2021*

*Duration : 3 Hrs* *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

| *Q.No* | *Questions* | *BLT* | *CO* | *Marks* |
|---|---|---|---|---|
| 1. | What do you understand by a compound bar? | L1 | 1 | 2 |
| 2. | Define principal stress and principal plane. | L1 | 1 | 2 |
| 3. | How beams are classify the according to its supports? | L2 | 2 | 2 |
| 4. | A beam subjected to a bending stress of 5 N/mm$^2$ and the section of modulus is 3530cm$^2$. What is the moment of resistance of the beam? | L2 | 2 | 2 |
| 5. | Why hollow circular shafts are preferred when compared to solid circular shafts? | L2 | 3 | 2 |
| 6. | Differentiate between close-coiled and open-coiled helical springs. | L2 | 3 | 2 |
| 7. | Relate the rate of loading, shear stress, bending moment, slope and deflection by integral equations? | L1 | 4 | 2 |
| 8. | When do you prefer moment area method? | L1 | 4 | 2 |
| 9. | Compare thin cylinders and thick cylinders. | L2 | 5 | 2 |
| 10. | Sate Lame's theorem. | L1 | 5 | 2 |

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

| *Q.No* | | *Questions* | *BLT* | *CO* | *Marks* |
|---|---|---|---|---|---|
| 11. | a | An axial pull of 40 kN is acting on a bar consisting of three sections of length 300 mm, 250 mm, and 200 mm and of diameters 20 mm, 40 mm, and 50 mm respectively. Find the stresses in each section and total extension of the bar.   | L3 | 1 | 16 |
| | | Or | | | |
| | b | A point in a strained material is subjected to mutually perpendicular stresses of 600 N/mm² (tensile) and 400 N/mm² (compressive). It is also subjected to a shear stress of 100 N/mm². Draw Mohr's circle and find the principal stress and maximum shear stress. | L3 | 1 | 16 |

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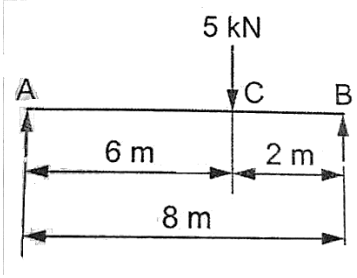
|---|---|---|---|---|---|
| 12. | a | A beam 8m long is simply supported at the ends and carries a uniformly distributed load of 1500 N/m and three concentrated loads of 1000 N, 2000 N, and 4000 N acting respectively at the left quarter point, center point, and right quarter point. Draw SFD and BMD. | L4 | 2 | 16 |
| | | Or | | | |
| | b | State the assumptions made in the theory of simple bending and derive the simple bending equation. | L4 | 2 | 16 |
| 13. | a | A hollow shaft of diameter ratio 3/8 is required to transmit 588 kW at 110 rpm. The maximum torque exceeds the mean by 20%. The shear stress is limited to 63 $N/mm^2$ and the twist should not be more than 0.0081 rad. Calculate the external diameter required satisfying both the conditions. Take G = 84 Gpa and Length = 3m. | L3 | 3 | 16 |
| | | Or | | | |
| | b | A closely coiled helical spring of round steel wire 5mm in diameter having 12 complete coils of 50mm mean diameter is subjected to an axial load of 150N. Find the deflection of the spring and the maximum shearing stress in the material. Modulus of rigidity (C) = 80Gpa. Also find stiffness of the spring. | L3 | 3 | 16 |
| 14. | a | A simply supported beam of length 8m is loaded as shown in figure. Calculate the slope and deflection of each point by the following methods. Assume E = $2.1 \times 10^5$ $N/mm^2$ and I = $78 \times 10^6$ $mm^4$.<br>i. Double integration method<br>ii. Macaulay's method | L4 | 4 | 16 |
| | |  | | | |
| | | Or | | | |
| | b | A simply supported wooden beam 150 mm wide and 250 mm deep has a span of 4 m. Determine the load, that can be placed at its centre to cause the beam a deflection of 12 mm. Take $E=6*10^6$ $kN/m^2$. And find the maximum slope. | L4 | 4 | 16 |
| 15. | a | A cylindrical thin drum 80 cm in diameter and 3m long has a shell thickness of 1 cm. if the drum is subjected to an internal pressure of 2.5 $N/mm^2$, Determine<br>i. Change in diameter<br>ii. Change in Length<br>iii. Change in volume<br>Take E = $2 \times 10^5$ $N/mm^2$ and Poisson's ratio = 0.25 | L4 | 5 | 16 |
| | | Or | | | |

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|---|---|---|---|---|
| b | The state of stress at a certain point in a strained material is shown in below figure. Calculate<br>i. Principle stress and inclination of the principal planes<br>ii. Normal, Shear and resultant stress on the plane MN. | L4 | 5 | 16 |