

**THE KAVERY ENGINEERING COLLEGE**  
(An Autonomous Institution)

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

*Fourth Semester*

*Agricultural Engineering*

AI3403 - Strength of Materials for Agricultural Engineering

*Regulations - 2021*

*Duration : 3 Hrs*

*Maximum : 100 Marks*

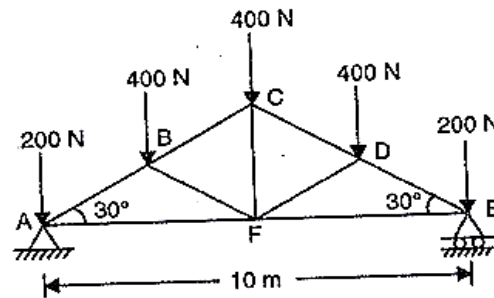
*PART - A (ANSWER ALL QUESTIONS) (Marks 10\*2=20)*

| <i>Q.No</i> | <i>Questions</i>                                                                                                                                                  | <i>BLT</i> | <i>CO</i> | <i>Marks</i> |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|--------------|
| 1.          | State Hooke's law.                                                                                                                                                | L1         | 1         | 2            |
| 2.          | What is meant by bulk modulus?                                                                                                                                    | L1         | 1         | 2            |
| 3.          | Justify how method of joints applied to Trusses carrying Horizontal and inclined loads.                                                                           | L2         | 2         | 2            |
| 4.          | Differentiate a frame and truss.                                                                                                                                  | L2         | 2         | 2            |
| 5.          | Define Shear force and Bending moment.                                                                                                                            | L2         | 3         | 2            |
| 6.          | Recall the Theory of Bending Equation.                                                                                                                            | L1         | 3         | 2            |
| 7.          | What is torsional rigidity?                                                                                                                                       | L1         | 4         | 2            |
| 8.          | Sketch the shear stress variation along the radius of a hollow shaft is subjected to torsion.                                                                     | L2         | 4         | 2            |
| 9.          | Compare double integration method and Macaulay's method.                                                                                                          | L2         | 5         | 2            |
| 10.         | A cantilever beam of length "l" is subjected to a concentrated load P at a distance of l/3 from the free end. What is the deflection of the free end of the beam? | L2         | 5         | 2            |

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

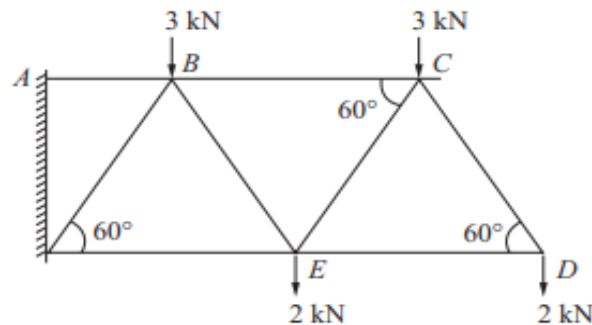
| <i>Q.No</i> | <i>Questions</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <i>BLT</i> | <i>CO</i> | <i>Marks</i> |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|--------------|
| 11.         | <p>a A copper tube 30 mm bore and 3 mm thick is plugged at its ends. It is just filled with water at atmospheric pressure. If an axial compressive load of 8 kN is applied to the plugs, find by how much the water pressure will increase? The plugs are assumed to be rigid and fixed to the tube.<br/>Take: <math>E = 100 \text{ GN/m}^2</math>; Bulk modulus = <math>2.2 \text{ GN/m}^2</math>; Poisson's ratio = 0.33</p> <p style="text-align: center;">Or</p> <p>b i A steel flat plate of thickness 10mm tapers uniformly from 60mm at one end to 40mm at the other end in a length of 600mm. if the bar is subjected to a load of 60kN find the extension take <math>E = 205 \text{ Mpa}</math>.</p> <p>ii Derive the relationship between bulk modulus and young's modulus.</p> | L3         | 1         | 16           |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | L3         | 1         | 8            |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | L3         | 1         | 8            |

12. a Analyze and predict the forces in all members of the truss shown in figure by method of sections. L4 2 16

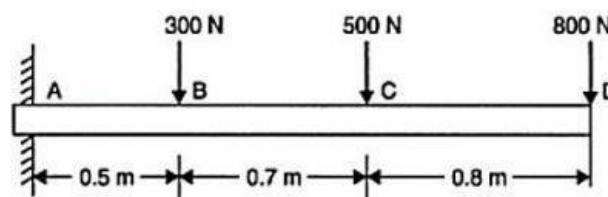


Or

- b Determine the forces in various members of the truss as shown in figure by method of tension coefficient. L4 2 16

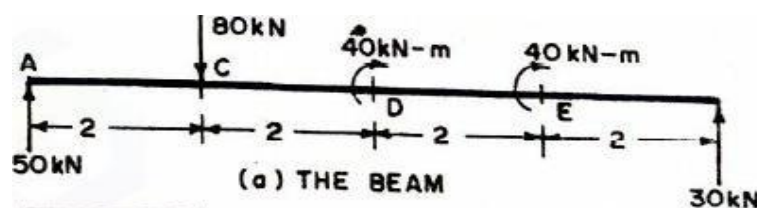


13. a A cantilever beam of length 2 m carries the point loads as shown in Fig. Draw the shear force and B.M. diagrams for the cantilever beam. L4 3 16

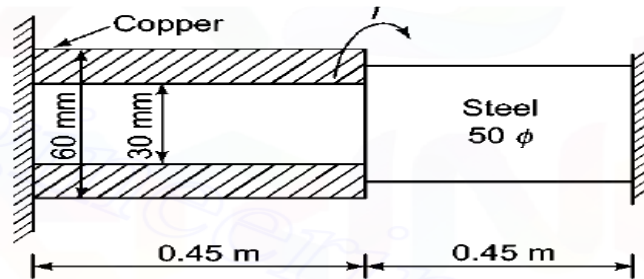


Or

- b Analyze the beam as shown in figure (a) and draw the S.F and B.M diagram. L4 3 16



14. a A hollow, circular copper shaft of 60 mm external and 30 mm internal diameter and a steel solid shaft of 50 mm radius are rigidly connected in series and subjected to a torque of 5000 Nm as shown in Figure. Determine the maximum stresses in the two shafts.  $G = 80$  GPa for steel and 40 GPa for copper. Length of the copper shaft is 0.5 m and that of the steel shaft is 0.45 m. L3 4 16



Or

- b Derive the expression for the maximum shear stress induced in a closed-coiled helical spring and also its stiffness. L3 4 16
15. a A cantilever of span 4 m carries a UDL of 4kN/m over a length of 2 m from the fixed end and concentrated load of 10 kN at the free end. Determine the slope and deflection of the beam at the free end using conjugate beam method. Assume,  $EI$  is uniform throughout the beam. L3 5 16
- Or
- b A cantilever of length  $L$  carries a point load  $W$  at its free end. The member is circular in section, having diameter  $D$  for a distance  $L/2$  from the fixed end and a diameter  $D/2$  for the remaining length. Find the deflection at the free end. L3 5 16

