A **Reg. No. :** | | | | | | | | | | | | |

# Question Paper Code: U5A03

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Fifth Semester

Agricultural Engineering

21UAG503-STRENGTH OF MATERIALS FOR AGRICULTURE ENGINEERS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Volumetric strain is defined as CO1- U

(a) dV/V (b) dL/L (c) db/b (d) dd/d

2. Stress is defined as the ratio of CO1- U

(a) Load to area (b) pressure to area (c) load to volume (d) pressure to volume

3. Which equation is used to find out the perfect frame CO1- U

(a) m= 2j+3 (b) m= 2j-2 (c) m= 2j-3 (d) m= 2j+2

4. A frame in which all member not lie in a single frame is called CO1- U

(a) Plain frame (b) Space frame (c) deficient frame (d) redudant frame

5. The bending moment at end supports of a simply supported beam is CO1- U

(a) maximum (b) minimum (c) zero (d) uniform

6. Sagging, the bending moment occurs at the _____ of the beam. CO1- U

(a) At supports (b) Mid span (c) Point of contraflexure (d) Point of emergence

7. ___ is a measure of the strength of shaft in rotation. CO1- U

(a) Polar modulus (b) Sectional modulus (c) Torsion modulus (d) Torsional rigidity

8. The units of torsional rigidity is CO1- U

(a) $Nmm^2$ (b) N/mm (c) N-mm (d) N

9. The radius of curvature of the deflected beam is CO1- U

(a) $\frac{M}{I} = \frac{E}{R}$ (b) $\frac{M}{J} = \frac{E}{R}$ (c) $\frac{N}{I} = \frac{E}{R}$ (d) $\frac{M}{C} = \frac{E}{R}$

10. Deflection of simply supported beam with point load as centre is--- CO1- U

(a)$y_c = \frac{w\ l^3}{48EI}$ $(b) y_c = \frac{w\ d^3}{EI}$ (c) $y_c = \frac{w\ ld^3}{EI}$ $(d) y_c = \frac{w\ d^3}{El}$

PART – B (5 x 2= 10Marks)

11. Define young's modulus. CO1- U

12. Explain in detail about deficient frame. CO1- U

13. State the points to remember for drawing SF and BM diagram. CO1- U

14. What is meant by torsional rigidity? CO1- U

15. Give the deflection equation of simply supported beam with point load at centre CO1- U

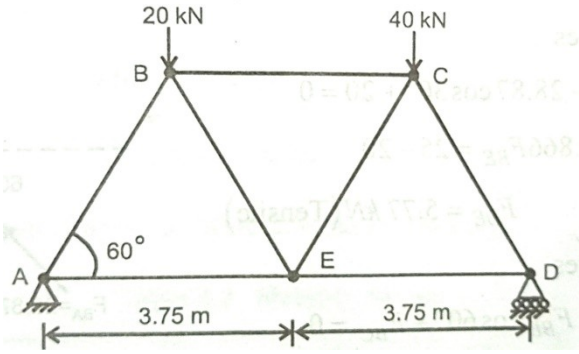
PART – C (5 x 16= 80Marks)

16. (a) Two vertical rods one of steel and the other of copper are each rigidly fixed at the top and 50 cm apart. Diameters and lengths of each rod are 2 cm and 4 m respectively. A cross bar fixed to the rods at the lower end carries a load of 5000 N such that the cross bars remains horizontal even after loading. Find the stress in each rod and position of the load on the bar. Take E= 2 × $10^5$ N/mm2 for steel and take E= 1 × $10^5$ N/$mm^2$ for copper CO2- App (16)

Or

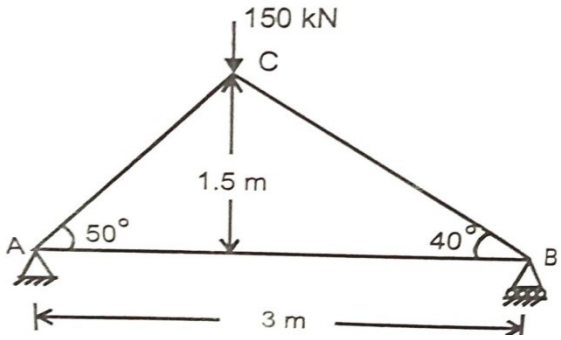
(b) Determine the changes in length , breath, thickness, volumetric strain and final volume of the steel bar of a steel bar is 5 m long, 20 mm wide and 10 mm thick and is subjected to an axial pull of 20 kN in the direction of its length. Take E= 2 × $10^5$ N/$mm^2$ and poisson's ratio =0.3 CO2- App (16)

17. (a) Determine the forces in all the members of the truss shown in fig. by using the method of joints. CO2- App (16)




Or

(b) Determine the forces in the members as shown in fig. by using the method of tension coefficient CO2- App (16)




18. (a) A cantilever beam of length 2 m carries a uniformly distributed load of 1 kN/m run over the entire length of 1.5 m from the free end draw the shear force and bending moment diagrams for the cantilever. CO2- App (16)

Or

(b) A 9 m length of SSB carries point load of 5 kN and 8 kN at distances of 3 m and 6 m from the left end. Draw the shear force and BM diagrams for the SSB CO2- App (16)

19. (a) Derive the equation for torque developed by the hollow circular shaft and give the assumptions. CO2- App (16)

Or

(b) The shearing stress is a solid shaft is not to exceed 40 N/ $mm^2$ when the torque transmitted as 20000 N- m. determine the minimum diameter of the shaft. CO2- App (16)

20. (a) Determine (i) slope at the left support (ii) deflection under the load and (iii) maximum deflection of a simply supported beam of the length 5 m, which is carrying a point load of 5 kN at a distance of 3 m from the left end. Take E for the material of the beam= $2.1 \times 10^5 N/mm^2$ and I= $1 \times 10^8 mm^4$ CO2- App (16)

Or

(b) A beam 3 m long, simply supported at its ends, is carrying a point load W ascentre. If the slope at the ends of the beam should not exceed 1° , find the deflection at the centre of the beam. CO2- App (16)