Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Fourth Semester

Agricultural Engineering

AI3403 - Strength of Materials for Agricultural Engineering

Regulations – 2021

Duration : 3 Hrs *Maximum: 100 Marks*

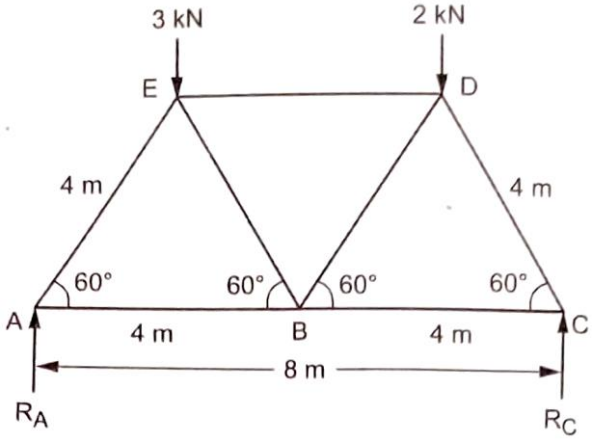
*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Recall the relation between E and K.	RE	1	2
2.	Compare thin and thick shells.	UN	1	2
3.	Name the analytical methods for finding out the forces in the members of a perfect frame.	RE	2	2
4.	What is tension coefficient?	RE	2	2
5.	Classify the different types of beams.	RE	3	2
6.	State the assumptions used to drive the simple bending equation.	UN	3	2
7.	Define torsional rigidity.	RE	4	2
8.	List out the stresses induced in the helical and carriage springs.	RE	4	2
9.	Justify the various methods of determining slope and deflection at a section in a loaded beam.	EV	5	2
10.	Write down the formula for maximum deflection of a cantilever with point load "W" at free end.	RE	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)*

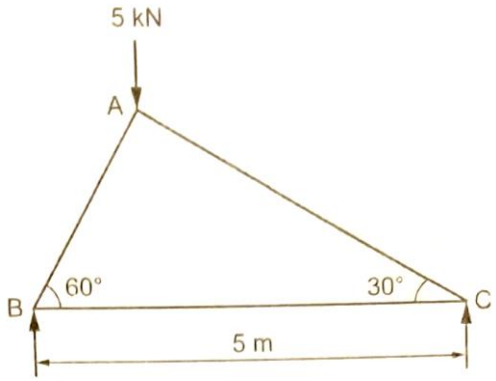
Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	A metallic bar 300 mm (x) × 100 mm (y) × 40 mm (z) is subjected to a force of 5kN (tensile), 6kN (tensile) and 4kN (tensile) along x, y and z directions respectively. Find the change in the volume of the block. Take E = 2×10^5 N/mm^2 and Poisson's ratio = 0.25.	AP	1	13
		Or			
	b	A thin cylindrical shell, 2.5 m long has 700 mm internal diameter and 8mm thickness. If the shell is subjected to an internal pressure of 1 MPa, Find i) The hoop and longitudinal stresses developed. ii) Maximum shear stress induced and iii) The changes in diameter, length and volume. Take modulus of elasticity of the wall materials as 200 GPa and Poisson's ratio as 0.3.	AP	1	13

12.	a	A truss of 8 m span consisting of seven members each of 4 m length supported at its ends and loaded as shown in Fig. List the forces in the members by method of joints.	AP	2	13



Or

	b	Analyze the forces in the members AB, BC and AC of the truss as shown in Fig.	AP	2	13



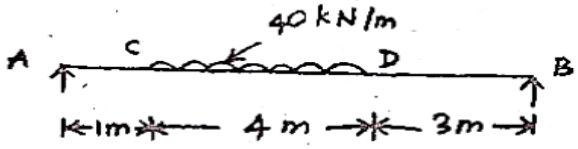
13.	a	A simply supported beam AB of length 5 m carries point loads of 8 kN, 10 kN and 15 kN at 1.5 m, 2.5 m and 4.0 m respectively from left hand support. Draw shear force diagram and bending moment diagram.	AP	3	13

Or

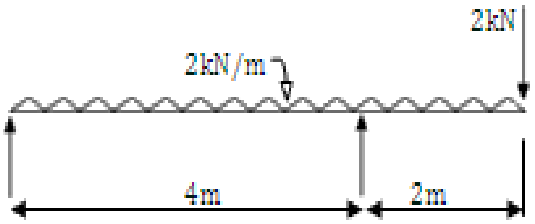
	b	A steel plate of width 120 mm and of thickness 20 mm is bent into a circular arc of radius 10 m. Analyze the maximum stress induced and the bending moment which will produce the maximum stress. Take E = 2×10^5 N/mm^2.	AP	3	13
14.	a	A hollow shaft of diameter ratio 3/5 is required to transmit 450 kW power at 120 rpm with a uniform twisting moment. The shearing stress in the shaft must not to exceed 60 N/mm^2 and the twisting length of 2.5 m must not exceed 1^0. Calculate the minimum external diameter of the shaft. Take G=8×10^4 N/mm^2.	AP	4	13

Or

	b	The stiffness of a close-coiled helical spring is 1.5 N/mm of compression under a maximum load of 60 N. The maximum shearing stress produced in the wire is 125 N/mm^2. The solid length of the spring (when the coils are touching) is given as 50 mm. Find (i) The diameter of wire (ii) The mean diameter of the coils (iii) Number of coils required. Take C = 4.5×10^4 N/mm^2.	AP	4	13

15.	a	Determine the deflection of the beam at its mid span and also the position of maximum deflection and maximum deflection. Take E = 2 x 10^5 N/mm^2 and I = 4.3 x 10^8 mm^4. Use Macaulay's method. The beam is given in figure. 	AP	5	13
		Or			
	b	A cantilever of span 4 m carries a uniformly distributed load of 4 kN/m over a length of 2 m from the fixed end and a concentrated load of 10 kN at the free end. Determine the slope and deflection of the cantilever at the free end using conjugate beam method. Assume EI is uniform throughout.	AP	5	13

*PART – C (Marks 1*15 = 15)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
16.	a	Draw the S.F and B.M diagrams for the overhanging beam carrying uniformly distributed load of 2 kN/m over the entire length and a point load of 2 kN as shown below. Locate the point of contra flexure. 	AP	3	15
		Or			
	b i	Classify and list the advantages of springs.	UN	4	6
	ii	Derive relation for deflection of an open coiled helical spring subjected to axial load W.	AP	4	9