Q. Code:245177

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

AE22409 – MECHANICS OF SOLIDS: THEORY AND PRACTICES

(Automobile Engineering)

(Regulation 2022)

TIME: 2 HOURS **MAX. MARKS: 60**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Predict the behavior of the materials for different loading conditions and characteristics of materials.	**3**
CO 2	Select suitable cross-sections for the beams and springs based on theoretical and experimental work.	**3**
CO 3	Estimate the Deflection of beams under a different types of loading conditions.	**3**
CO 4	Select the dimensional parameters for the shafts and springs under torsion loads through the different types of testing	**3**
CO 5	Develop a basic understanding of Biaxial Stresses and impact tests on metals.	**3**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Draw the stress strain curve for ductile & Brittle material.	**1**	**2**
2.	Find the minimum diameter of a steel wire, which is used to raise a load of 2000 N if the stress in the rod is not to exceed 80 N/mm^2.	**1**	**3**
3.	Draw the shear force and bending moment diagram for simply supported beam of uniform distributed load.	**2**	**2**
4.	State the assumptions made in the theory of simple bending.	**2**	**2**
5.	Write down the equation for the maximum slope and deflection of a simple supported beam carrying a central point load 'W'.	**3**	**2**
6.	What is the conjugate beam theorem of slope and deflection?	**3**	**2**
7.	Find the minimum diameter of shaft required to transmit a torque of 29820 Nm if the maximum shear stress is not to exceed 45 N/mm^2.	**4**	**3**
8.	What is the expression for the stiffness of a closed coiled helical spring when subjected to axial load W?	**4**	**2**
9.	What do you mean by Principal strains?	**5**	**2**

10.	Differentiate the circumferential stress with longitudinal stress.	**5**	**3**	

PART- B (3 x 10 = 30 Marks)

		Marks	CO	RBT LEVEL
11. (a)	A member ABCD is subjected to a point load of P_1, P_2, P_3, P_4 as shown in figure 1. Calculate the force P_2 Necessary for equilibrium. If P_1 = 45 kN, P_3 = 450 kN & P_4 = 130 kN. Find the total elongation of the bar. Take young's modulus of the bar is 2.1 x 10^5 N/mm^2.	**(10)**	**1**	**3**

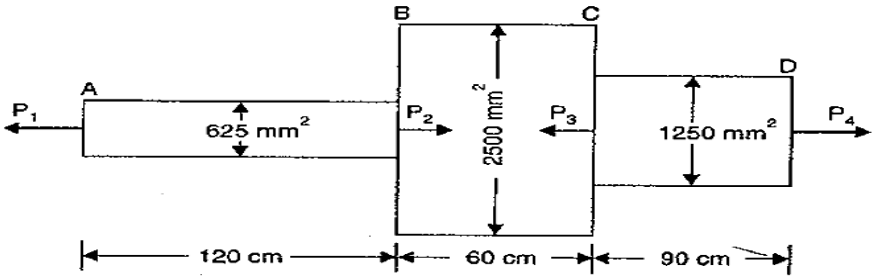

Figure 1

(OR)

(b)	A reinforced concrete column 500 mm x 500 mm in a section is reinforced with 4 steel bars of 25 mm diameter, one in each corner, and the column is carrying a load of 10 kN as shown in figure 2. Find the stress in the concrete and steel bars. Take E for steel as 210 GPa and E for concrete as 14 GPa.	**(10)**	**1**	**3**

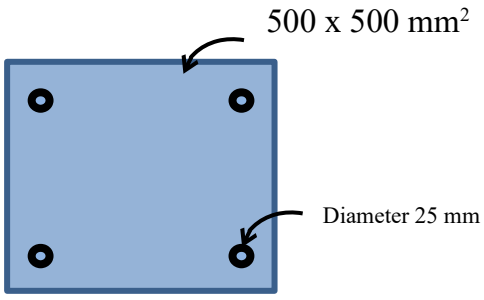

Figure 2

12. (a)	A simply supported beam of length 6 m, carries the uniform distributed load and two points of load as shown in figure 3. Draw the shear force diagram and bending moment diagram for the beam. Also calculate the	**(10)**	**2**	**3**

maximum bending moment.

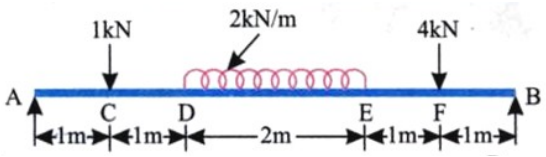

Figure 3

(OR)

(b)	A beam is of square of the side 'a'. If the permissible bending stress is 'σ'. Find the moment of resistance when the beam section is place such that (i) two sides are horizontal, (ii) one diagonal is vertical. Find also the ratio of the moment of the resistance of the section in the two positions.	**(10)**	**3**	**3**

13. (a)	A beam of length 6 m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support as shown in figure 4. Take young's modulus is 2 x 10^5 N/mm^2 and moment of inertia is 85 x 10^6 mm^4. Find (i) Deflection under each load, (ii) Maximum deflection and (iii) The point at which maximum deflection occurs.	**(10)**	**3**	**3**

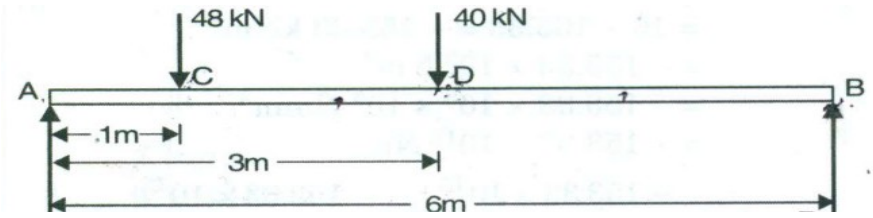

Figure 4

(OR)

(b)	A simply supported beam AB of length L which carries uniform distributed load of w/unit length on whole span of the beam. Find out the slope at support and deflection of the mid point of the simply supported beam. Take EI as constant.	**(10)**	**3**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.14 is compulsory)

		Marks	CO	RBT LEVEL
14.	Determine the diameter of a solid shaft which will transmit 300 kW at 250 rpm. The maximum shear stress should not exceed 30 N/mm^2 and twist	**(10)**	**4**	**3**

should not be more than 1^0 in a shaft length of 2 m. Take modulus of rigidity is 1 x 10^5 N/mm^2.

****