Q. Code:987468

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

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

Third-Semester

ME18304 – MECHANICS OF SOLIDS

(Mechanical Engineering)

(Regulation 2018/2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Students will predict the behavior of the materials for different loading and support conditions	**3**
CO 2	Students will select suitable cross sections for the beams under different loading conditions	**4**
CO 3	Students will identify the methodology to find the deflections occurred in beams under different loading conditions.	**3**
CO 4	Students will select suitable dimensional parameters for the shafts under torsional loads and springs based on calculated stresses, deflection under different conditions.	**4**
CO 5	Students will determine the suitable dimensions for pressure vessels given the loading conditions	**4**

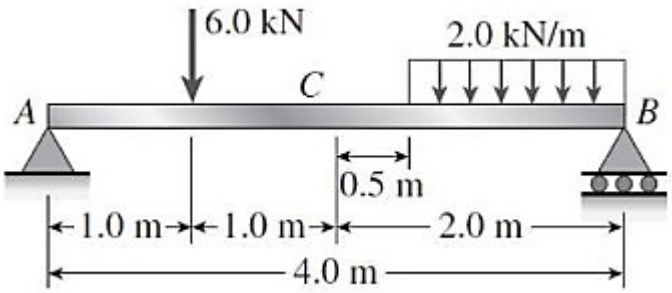
PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Give example for ductile, brittle and malleable materials.	**1**	**2**
2.	When will you apply principle of superposition for beams?	**1**	**2**
3.	What do you mean by simple bending?	**2**	**2**
4.	A fixed beam 3 m long carries a load of 40 KN at its mid span. Calculate the shear force and bending moment at the midsection	**2**	**2**
5.	What are the various types of springs? Give an application for each spring?	**3**	**2**
6.	Why hollow circular shafts are preferred when compared to solid circular shafts in torsional loads?	**3**	**2**
7.	Define: Mohr's Theorem for deflection.	**4**	**2**
8.	Why moment area method is more useful, when compared with double integration?	**4**	**2**
9.	Write the effect of riveting a thin cylindrical shell?	**5**	**2**
10.	Give the expression for hoop stress for thin spherical shells.	**5**	**2**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Draw stress strain curve for mild steel and explain about the silent points.	**(14)**	**1**	**3**
	(OR)			
(b)	A reinforced concrete column 600 mm × 400 mm in a section is reinforced with 4 steel bars of 30 mm diameter; one in each corner, the column is carrying a load of 1500 kN. Determine the level of stress in the concrete and steel bars. Take E for steel = 210×10^3 N/mm^2 and E for concrete = 14×10^3 N/mm^2.	**(14)**	**1**	**3**
12. (a)	Draw the SF and BM diagrams for the beam shown in figure and find out the position and the magnitude of maximum moment.	**(14)**	**2**	**3**



(OR)

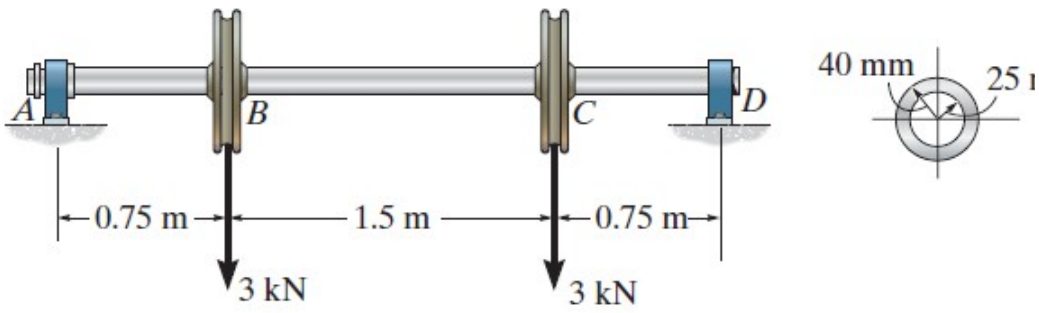
(b)	A beam 10 m long has rectangular section of 60 mm width and 120 mm depth. If the beam is carrying a uniformly distributed load of 5 kN/m, over entire length of beam find the maximum bending stress developed in the beam.	**(14)**	**2**	**3**
13. (a)	A beam is simply supported at its ends over a span of 10 m and carries two concentrated loads of 150 kN and 80 kN at a distance of 2 m and 5 m respectively from the left support. Calculate deflection under the 150 kN and 80 kN loads. Assume EI = 36 x 10^4 kN-m^2.	**(14)**	**3**	**3**
	(OR)			
(b)	A simply supported beam AB of span 4m, carrying a load of 100 kN at the mid span C has cross sectional moment of inertia 24 x 10^6 mm^4 over the left half of the span and 48 x 10^6 mm^4 over the right half. Find the slope at two supports and the deflection under the load. Take E = 200 GPa.	**(14)**	**3**	**3**

14. (a)	Determine the dimensions of a hollow circular shaft with a diameter ratio of 4:3 which is to transmit a power of 60 kW at 250 rpm. The maximum shear stress in the shaft is limited to 60 GPa and the angle of twist to 2.8° in a length of 4 m. Take Modulus of rigidity is 75 GPa.	**(14)**	**4**	**3**
	(OR)			
(b)	Two shafts of the same material and of same lengths are subjected to the same torque, if the first shaft is of a solid circular cross section and the second shaft is of hollow circular section, whose internal diameter is 0.8 times the outside diameter and the maximum shear stress developed in each shaft is same, compare the weights of the shafts. Infer the best cross section based on the result obtained.	**(14)**	**4**	**3**
15. (a)	A cylindrical vessel 2m long and 500mm in diameter with 10mm thick plates is subjected to an internal pressure of 3 MPa. Calculate the change in volume, diameter and length of the vessel. Take E = 200 GPa and Poisson's ratio = 0.3 for the vessel material.	**(14)**	**5**	**3**
	(OR)			
(b)	Determine the maximum and minimum hoop stress across the section of a pipe of 400 mm internal diameter and 100mm thick, when the pipe contains a fluid at a pressure of 8 N/mm^2. Apply Lames theorem to determine the stresses.	**(14)**	**5**	**4**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	The shaft is supported by a smooth thrust bearing at A and smooth journal bearing at D. If the shaft has the cross section shown, determine the absolute maximum bending stress in the shaft.	**(10)**	**2**	**5**



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