SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR

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QUESTION BANK (DESCRIPTIVE)

Subject with Code: STRENGTH OF MATERIALS(18CE0151) **Branches**: **ME&AG**

Year &Sem: II-B.Tech &I-Sem **Regulation:** R18

UNIT – I

1. (a)Define elasticity and plasticity? 2M

(b)State Hooke's law with equation? 2M

(c)Define the terms Factor of Safety and Poisson's ratio? 2M

(d)What is the deference between Resilience and Proof Resilience? 2M

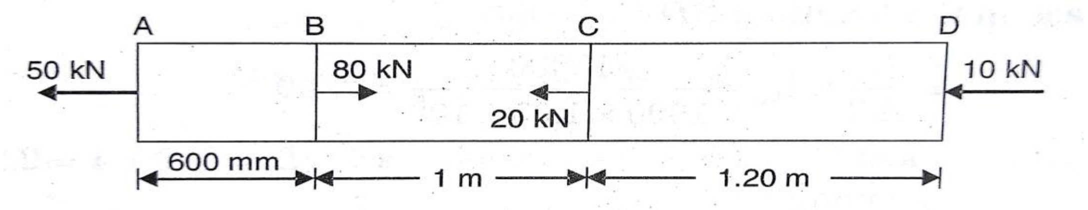
(e)What are the practical applications of impact loads? 2M

2. a. Define stress and strain and Explain their types. 5M

b. A circular rod of diameter 20 mm and 500 mm long is subjected to a tensile force of 45 KN. the modulus of elasticity for the material is 2.1×10^5 N/mm^2. Find the stress, strain & the elongation of circular rod. 5M

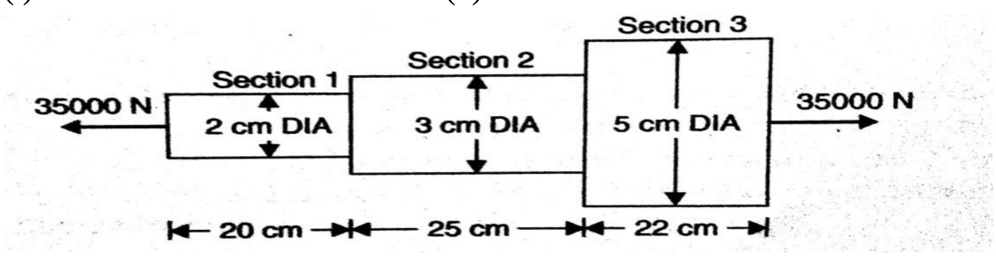
3. a. Explain briefly about the stress strain diagram for mild steel. 5M

b. A brass bar, having cross-sectional area of 1000 mm^2, is subjected to axial forces as shown in figure. Find the total elongation of the bar. Take E=1.05×10^5 N/mm^2 5M



4. An axial pull of 35000 N is acting on a bar consisting of three lengths as shown in figure. If the Young's modulus is taken as 2.1×10^5 N/mm^2, Determine: 10M

(i) Stresses in each section and (ii) Total extension of the bar.



5. A steel rod of 3 cm diameter is enclosed centrally in a hollow copper tube of external diameter 5cm and internal diameter of 4cm. the composite bar is then subjected to an axial pull of 45000N.if the length of each bar is equal to 15 cm, determine: i) The stresses in the rod and tube, and (ii) Load carried by each bar 10M

6. A steel rod of 3 cm diameter and 5 m long is connected to two grips and the rod is maintained at temperature of 95^{o}C. Determine the stress and pull exerted when the temperature falls to 30^{o}C, if 10M

(i) The ends do not yield, and (ii) The ends yield by 0.12 cm.
Take E=2x105N/mm2 and α=12x10-6/oc

7.		Determine the changes in length, breadth and thickness of a steel bar which is 4 m long, 30 mm wide and 20 mm thick and is subjected to axial pull of 30 KN in the direction of its length. Take $E=2x10^5 N/mm^2$ and $\mu=0.3$	10M
8.	**a.**	A steel bar 300 mm long, 50 mm wide and 40 mm thick is subjected to a pull of 300 KN in the direction of its length. Determine the change in volume Take $E=2x10^5 N/mm^2$ and $\mu=0.25$.	5M
	b.	Define the following terms (i) Elasticity & Plasticity (ii) Hooke's law & factor of safety(iii) Lateral & longitudinal strains	5M
9.		Define Strain energy & resilience. A tensile load of 60 KN is gradually applied to a circular bar of 4 cm diameter and 5 m long if $E=2x10^5 N/mm^2$. Determine: i) stretch in the rod (ii) stress in the rod and (iii) strain energy absorbed by the rod	10M
10.	**a**	Define Bulk Modulus. Calculate the Bulk modulus for a material having young's modulus $1.2x10^5 N/mm^2$ and $\mu=1/4$.	5M
	b	A bar of 30mm diameter is subjected to a pull of 60 KN. The measured extension on gauge length of 200 mm is 0.1mm and change in diameter is 0.004 mm, calculate: (i) Young's modulus (ii) Poisson's Ratio and (iii) bulk modulus.	5M

UNIT-II

1 (a) What are the types of supports? 2M
(b) Write the classification of beams? 2M
(c) Explain the different types of loads with diagrams 2M
(d) What is the difference between simply supported beam and cantilever beam? 2M
(e) What is the use of SFD and BMD? 2M

2 A cantilever of length 3 m carries a uniformly distributed load of 2.5 KN/m length over the whole length and a point of 3.5 KN at the free end. Draw SFD and BMD for the cantilever 10M

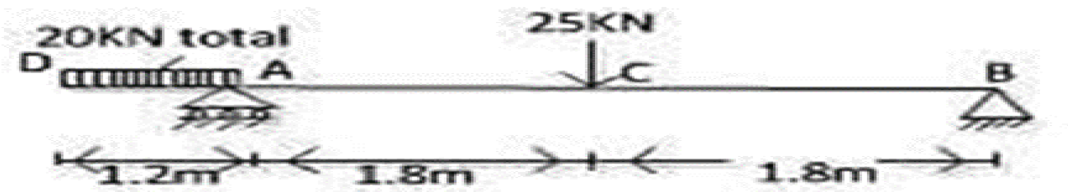
3 A simply supported beam of length 8 m carries point load of 4 KN and 7 KN at distances 3 m and 6 m from the left end. Draw SFD and BMD for the beam. 10M

4 A cantilever of length 3 m carries a uniformly distributed load of 1.5 KN/m run over a length of 2 m from the free end. Draw SFD and BMD for the beam 10M

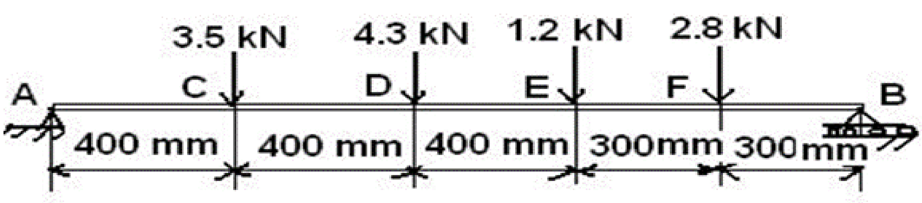
5 Simply supported beam of length 6 m carries a uniformly increasing load of 600 N/m at one end to 1500 N/m run at the other end. Draw SFD and BMD for the beam. And also calculate the position and magnitude of maximum bending moment. 10M

6 Draw the SFD and BMD for the cantilever beam carrying uniformly distributed load of whole length and also derive an equation for it 10M

7 Draw the shear force and bending moment diagrams for the beam shown in the figure. 10M



8 **a** Draw the S.F and B.M diagram for a cantilever beam of span ‘L’m loaded with UDL of W KN/m. 5M
b Draw the shearing force and bending moment diagrams for the beam shown in figure. 5M



9 **a** Define beam. Sketch different types of beams, types of supports and types of loads indicating their names. 5M
b Draw the S.F and B.M diagram for a S.S.B of span ‘L’ m loaded with UDL of W KN/m. 5M

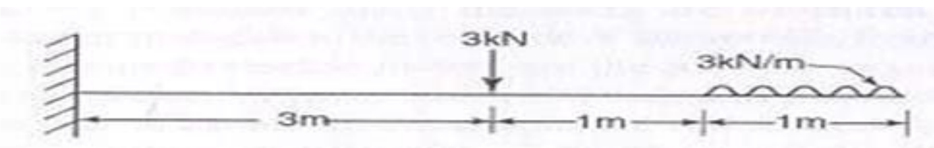
10 Draw the shear force and bending moment diagram for a simply supported beam AB of span 9 meters carrying a uniformly distributed load of 18 KN per meter for a distance of 4 meters from the left support A. 10M

UNIT-III

1		(a) Define bending and shear stress	2M
		(b) What is the meaning of strength of section?	2M
		(c) What is neutral layer and neutral axis?	2M
		(d) What is the theory of simple bending?	2M
		(e) What are the assumptions made in theory of simple bending?	2M
2		Derive the bending equation	10M
3		A beam of cross – section of an isosceles triangle is subjected to a shear force of 45 KN at a section where base width = 125 mm and height = 400 mm. Determine: (i) Horizontal shear stress at the neutral axis. (ii)The distance from the top to the beam where shear stress is maximum and (iii)Value of maximum shear stress.	10M
4		Derive the formula for shear stress at a section	10M
5		A timber beam of rectangular section is to support a load of 30 k N uniformly distributed over a span of 4 m when beam is simply supported. If the depth of section is to be twice the breadth, and the stress in the timber is not to exceed 8 N/mm2, find the dimensions of the cross section	10M
6		A steel beam of I –section, 200 mm deep and 160 mm wide has 16 mm thick flanges and 10 m thick web. The beam is subjected to a shear force of 200 KN. Determine the shear stress distribution over the beam section.	10M
7		A simply supported beam carries a uniformly distributed load of intensity 30 N/mm over the entire span of 2 m. The cross section of beam is a T-section having flange 125 x 25 mm and web 175 x 25 mm. Calculate the maximum shear stress for the section subjected to maximum shear force. Also draw the shear stress distribution	10M
8	**a**	Define section modulus. Write the units for section modulus. Derive the section modulus for hollow circular cross section	5M
	b	A timber beam 120 mm wide and 200 mm deep is simply supported over a span of 4 m. The beam carries a UDL of 2.8 KN/m over the entire length. Find the maximum bending stress induced. Plot the bending stress distribution at the quarter span cross section of the beam.	5M
10		A beam is simply supported and carries a uniformly distributed load of 40KN/m run over the whole span. The section of the beam is rectangular having depth as 500mm. If the maximum stress in the material of the beam is 120 N/mm^2 and moment of inertia of the section is 7 x 108mm^4, find the span of the beam.	10M

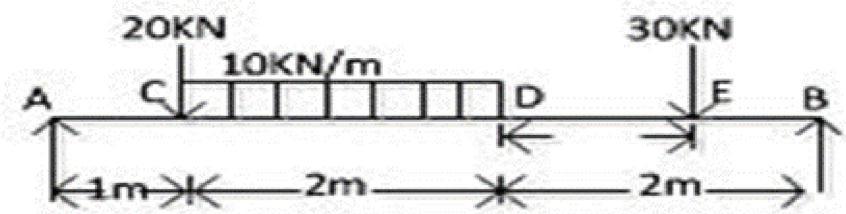
UNIT IV

1	a) What is deflection of beam?	2M
	b) What causes deflection of beam?	2M
	c) How do you control beam deflection??	2M
	d) What is torsion of circular shaft?	2M
	e) Define polar modulus?	2M
2	Derive the relation between slope, deflection and radius of curvature	10M
3	Determine: (i) slope at the left support, (ii) deflection under the load and (iii) maximum deflection of a simply supported beam of length 6 m, which is carrying a point load of 5 KN at a distance of 2 m from the left end. Take E = 2 x 1055 N/mm2 and I = 1 x 108 mm^4.	10M
4	A beam of length 8 m is simply supported at its ends and carries two-point loads of 36 KN and 46 KN at a distance of 1.5 m and 4 m from the left support. Find: (i) deflection under each load. (ii) Maximum deflection and (iii) The point at which maximum deflection occurs, given E = 2 x 105 N/mm2 and I = 85 x 106 mm4. Use Macaulay's method?	10M
5	A cantilever of length 4 m carries a uniformly distributed load 3 KN/m over a length of 1.5 m from the free end and a point load of 2 KN at the free end. Find the slope and deflection at the free end if E = 2.1 x 105 N/mm2 and I = 6.667 x 107 mm4.?	10M
6	Find the slope and deflection at the free end of the cantilever shown in figure. Take EI = 1 x1010kN-mm^2	10M



Fig

7	Determine the deflections at points C, D and E in the beam shown in the figure. Take E=200KN/mm2 and I=60 x106mm^4	10M



8	A hollow shaft of external diameter 120 mm transmits 300 kW power at 200 r.p.m. Determine the maximum internal diameter if the maximum stress in the shaft is not exceeded to 60 N/mm^2.	10M
9	Derive an expression for Torque transmitted by a hollow circular shaft	10M
10	A composite shaft consists of steel rod 60 mm diameter surrounded by a closely fitting	10M

tube of brass. Find the outside diameter of the tube so that when a torque of 1000N-m is applied to the composite shaft, it will be shared equally by the two materials. Take C for steel 8.4 x10^4 N/mm^2 and C for brass 4.2 x10^4 N/mm^2. Find also the maximum shear stress in each material and common angle of twist in a length of 4 m.

UNIT-V

1	(a) Define thin cylinder and thick cylinder?	2M
	(b) What is thin walled pressure vessel?	2M
	(c) Define circumferential and longitudinal stress?	2M
	(d) How do you measure internal pressure in a tank?	2M
	(e) Why is pressure vessel cylindrical?	2M
2	A cylindrical thin drum 80 cm in diameter and 3 m long has a shell thickness of 1 cm. If the drum is subjected to an internal pressure of 2.5 N/mm^2, determine (i) change in diameter (ii) change in length and (iii) change in volume. Take E= 2x 10^5 N/mm^2 Poisson's ratio 0.25.	10M
3	A cylindrical vessel, whose ends are closed by means of rigid flange plates, is made of steel plate 3 mm thick. The length and the internal diameter of the vessel are 50 cm and 25 cm respectively. Determine the longitudinal and hoop stresses in the cylindrical shell due to an internal fluid pressure of 3 N/mm^2. Also calculate the increase in length, diameter and volume of the vessel. Take E as 2x 10^5 N/mm^2 and Poisson's ratio 0.3.	10M
4	A copper cylinder, 90 cm long, 40 cm external diameter and wall thickness 6 mm has its both ends closed by rigid blank flanges. It is initially full of oil at atmospheric pressure. Calculate additional volume of oil which must be pumped into it in order to raise the oil pressure to 5 N/mm^2 above atmospheric pressure. For copper assume E= 1.0 x 10^5 N/mm^2 and Poisson's ratio 1/3. Take bulk modulus of oil as K= 2.6 x 10^3 N/mm^2.	10M
5	A cast iron pipe 200 mm internal diameter and 12 mm thick is wound closely with a single layer of circular steel wire of 5 mm diameter, under a tension of 60 N/mm^2. Find the initial compressive stress in the pipe section. Also find the stresses set up in the pipe and steel wire, when water under a pressure of 3.5 N/mm^2 is admitted in to the pipe. Take E = 1 x 10^5 N/mm^2 for cast iron and for steel E = 2 x 10^5 N/mm^2.poisson's ratio is given as 0.3.	10M
6	Derive the formula for longitudinal and circumferential stresses	10M

7	Determine the maximum and minimum hoop stress across the section of a pipe of 400 mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8 N/mm$^{2.}$ Also sketch the radial pressure and hoop stress distribution across the section.	10M
8	A compound tube is composed of a tube 250 mm internal diameter and 25 mm thick shrunk on a tube of 250 mm external diameter and 25 mm thick. The radial pressure at the junction is 8 N/mm^2.the compound tube is subjected to an internal pressure of 84.5 N/mm^2. Find the variation of the hoop stress over the wall of the compound tube.	10M
9	A steel tube of 200 mm external diameter is to be shrunk on to another steel tube of 60 mm internal diameter. After shrinking the diameter at the junction is 120 mm. Before shrinking on the difference of diameter at the junction is 0.08 mm. Find the hoop stresses developed in the two tubes after shrinking on and the radial pressure at the junction. Take E= 2x 10^5 N/mm^2.	10M
10	Derive the expression for stresses developed in a compound thick cylinder (Lame's theorem).	10M