QP Code: RD21BTECH075 | Reg. No | | | | | | | | | | | AR 21

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Third Semester - Regular) Examinations, December – 2022

21BMEPC23002 – Mechanics of Solids

(Mechanical Engineering)

Time: 3 hrs | Maximum: 70 Marks

Answer ALL questions

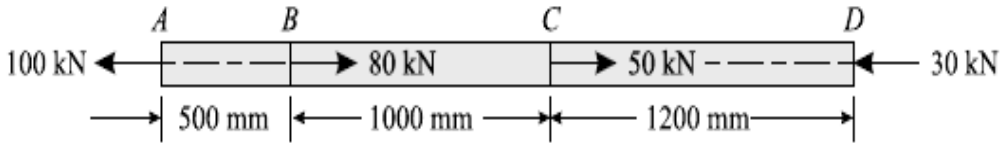
(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Define stress and strain.	CO1	1
b. Define complimentary shear stress.	CO1	1
c. Define point of contraflexure? Where it occurs?	CO3	2
d. Wire winding over thin cylinder improves strength of the wall, Justify.	CO2	2
e. A shaft of 150 mm diameter transmits 100 kW at 200 rpm, calculate the maximum shear stress developed in the shaft.	CO4	2

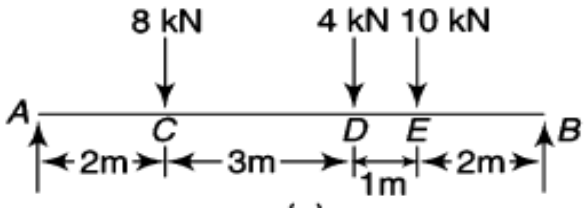
PART – B **(15 x 4 = 60 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Plot the stress-strain diagram for ductile material. Explain its salient features.	8	CO1	3
b. A brass rod of 2m long is fixed at both its ends. If the thermal stress is not to exceed 76.5 MPa, calculate the temperature through which the rod should be heated. Take the values of α and E as 17 X 10^{-6} / K and 90 GPa respectively.	7	CO1	3
(OR)			
c. Establish the relation between Young's modulus (E), modulus of rigidity (G) and bulk modulus (K).	8	CO1	3
d. A brass bar having cross-sectional area 500 mm2 is subjected to axial forces as shown in fig. Find the total elongation in the bar if E = 80 GPa.	7	CO1	4

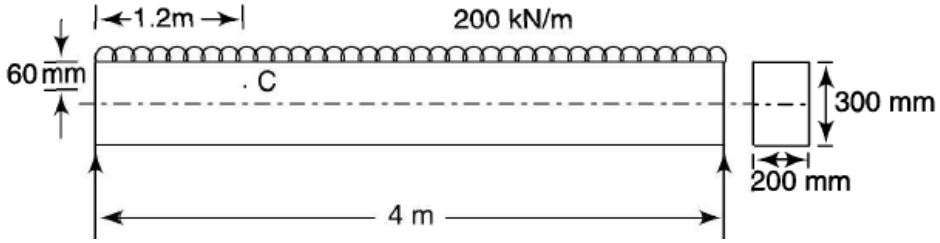


3.a. Derive the expressions for circumferential stress and longitudinal stress for a thin cylinder.	7	CO2	3
b. A cylindrical drum of 800 mm diameter and 4 m long is made of 10 mm thick plate. If the drum is subjected to an internal pressure of 2.5 MPa, determine the circumferential and longitudinal stress & strain developed in the wall. Take E = 200 GPa and μ = 0.3.	8	CO2	4
(OR)			
c. The stresses on two perpendicular planes through a point in a body are 30 MPa and 15 MPa both tensile along with a shear stress of 25 MPa . Find the magnitude and direction of principal stresses.	7	CO1	5

d.	A simply supported beam of 8 m carries three point loads as shown in the fig. . Draw shear force and bending moment diagram of the beam.	8	CO3	5



4.a.	Deduce the bending equation, $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$	8	CO3	3
b.	Figure shows a simply supported 200 mm wide 300 mm deep and 4 m long beam. Determine the bending moment and bending stress at the point C which is 60 mm below the top surface and 1.2 m from the left support.	7	CO3	4



(OR)

c.	A cast-iron bracket of I-section has its top flange as 150 mm × 30 mm, bottom flange as 100 mm × 30 mm and web as 200 mm × 30 mm. The overall depth of the section is 260 mm. The bracket is subjected to bending. If the maximum tensile stress in the top flange is not to exceed 10 Mpa, determine the bending moment of the section can take, if the beam is subjected to shear force of 100 kN, sketch the stress distribution over the depth of the section.	15	CO4	5
5.a.	Derive the torsion equation for a solid shaft of diameter d subjected to a twisting moment T.	7	CO4	3
b.	A shaft transmits 800 kW of power at 210 rpm. Determine the actual working stress and the diameter of the shaft if the shaft twists one degree on a length of 18 diameters and the shear stress is not to exceed 50 MPa. Take G = 81 GPa	8	CO4	4

(OR)

c.	Describe the advantage of hollow shaft over solid shaft.	3	CO4	2
d.	An 800 mm long shaft with a diameter of 80 mm carries a flywheel weighing 4 kN at its midway. The shaft transmits 24 kW at a speed of 240 rpm. Determine the principal stresses and the maximum shear stress at the ends of a vertical and horizontal diameter in a plane near the flywheel.	12	CO4	4

--- End of Paper ---