K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester:IV
Class:SY	Program:B.Tech
Branch Code:MEC	Pattern:2022
Name of Course:Mechanics of Material	Course Code:MEC222013
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

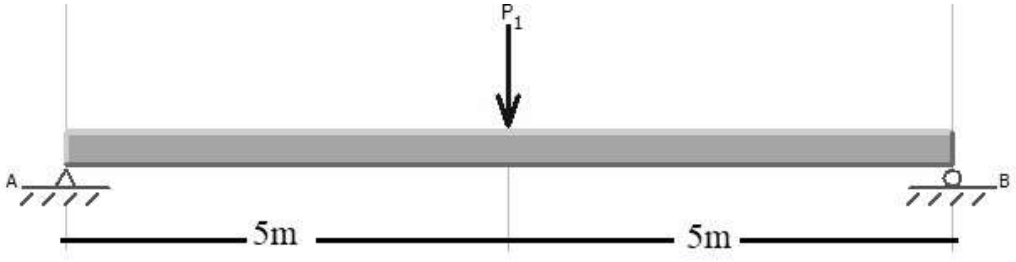
1. This question paper contains 04 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Question No. 1 Attempt following Question

1a)	A steel tube of 50mm outer diameter and 40 mm inner diameter and 300mm long is subjected to axial force 50kN. Find the axial deformation of tube and cross section area. Take modulus of elasticity of material is 210GPa.	(6)	CO1

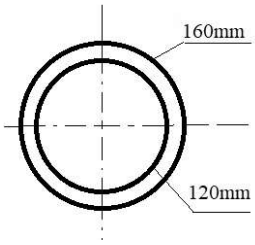
Question No. 2 Attempt following Question

2a)	A simply supported beam is loaded by 40 kN at center as shown following figure. Determine the shear force and bending moment at support end and load position, also draw the SFD and BMD	(6)	CO2



Question No. 3 Attempt following Question

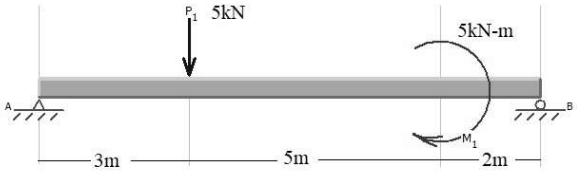
3a)	A hollow cylindrical strut, external diameter 160mm and internal diameter 120mm is used as strut length is 4m, one end fixed other end free. Calculate buckling load using Euler's formula. Take E=210GPa, Leq=2L	(6)	CO1, CO2



OR

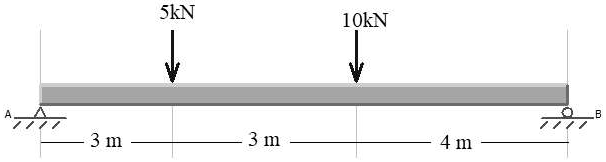
3b) A hollow cylindrical strut, external diameter 160mm and internal diameter 120mm is used as strut length is 4m, one end fixed other end free. Calculate crippling load using Rankin's formula. E=210GPa, Assume crushing stress 310MPa and Rankin's constant a=1/7500, Leq=2L (6) CO1, CO2

3c) A simply supported beam AB of span 10m is loaded as shown in fig. Determine the slope at 2m and 4m from fixed support. (10) CO1, CO2



OR

3d) A simply supported beam AB of span 10m is loaded as shown in fig. Determine the deflection and slope at 4m from fixed support. (10) CO1, CO2



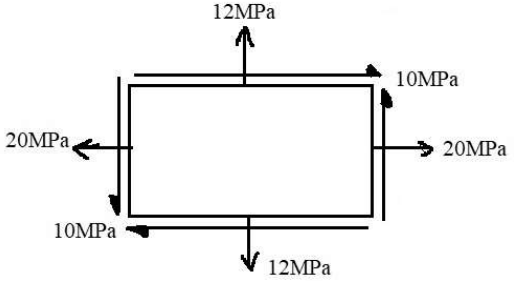
Question No. 4 Attempt following Question

4a) Determine the principal stresses, maximum shearing stresses and locations of planes for element loaded as given. $\sigma x=50N/mm^2$, $\sigma y= 200N/mm^2$, $\tau_{xy}=100N/mm^2$ Use Mohr's circle method. (6) CO3

OR

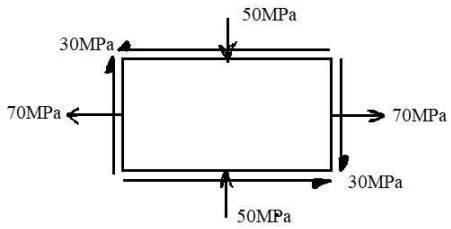
4b) Explain the Graphical method for determine the principal stresses and its plane by using Mohr's circle method. (6) CO3

4c) Find the magnitude and direction of resultant stresses on the planes, carrying maximum shear stress. Solve analytically (10) CO3



OR

4d) Determine the Principal stresses , angle of plane where stresses are maximum Solve analytically (10) CO3



Question No. 5 Attempt following Question

5a) Find the power transmitting capacity of shaft having 50mm diameter and which is connected at electric motor rotating at 1500rpm. If maximum permissible shear stress of shaft is 80Mpa. (6) CO1, CO4

OR

5b) A hollow shaft has outer diameter 100mm, inner 80mm. It is subjected to tensional moment of 20kNm. For this shaft, determine (6) CO1, CO4

1-Shear stress at the outer surface

2–Shear stress at the inner surface

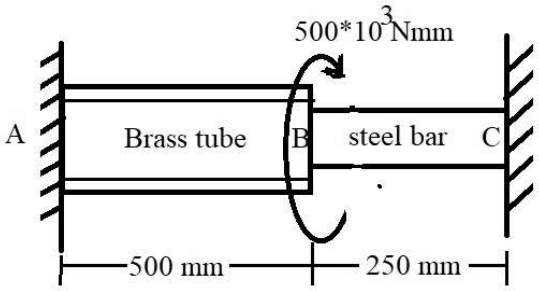
3- Angle of twist in a length of 4 m. Assume modulus of rigidity is 80GPa.

5c) A composite shaft ABC is fixed at A and C. It is subjected to a torque of 500Nm at B. Brass tube having 25mm inner dia. diameter and 30mm outer diameter. Steel bar is 20mm in diameter. Find: (10) CO1, CO4

1) Reactive torque at A

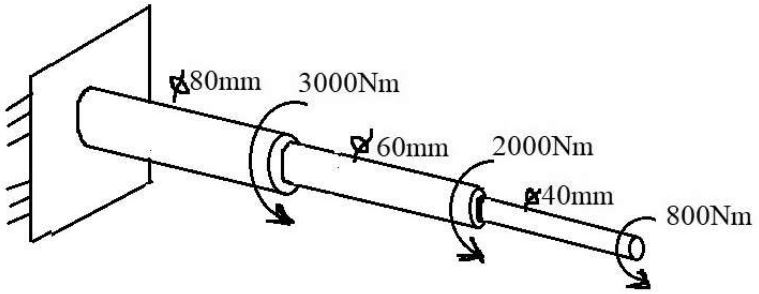
2) Maximum shear stress for steel bar

3) Angle of twist for steel bar. Take: G For brass=50GPa & G for steel- 80GPa



OR

5d) A steeped shaft is subjected to torque as shown fig. The length of each section is 0.5 m. If the material has shear modulus of elasticity G= 80GPa. What is the angle of twist in degrees at free end? (10) CO1, CO4



xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx