Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - OCT 2023

Semester : Semester III - 2022
Course Code : CIV2007_v02
Course Name : CIV2007_v02 - STRENGTH OF MATERIALS
Program : B.TECH

Date : 30-OCT-2023
Time : 2:00PM - 3:30PM
Max Marks : 50
Weightage : 25%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

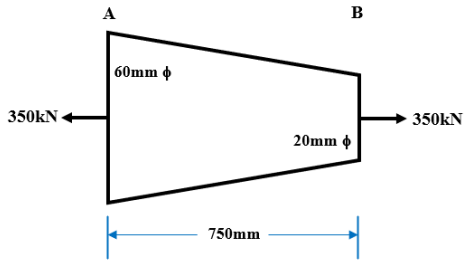
PART A

ANSWER ALL THE QUESTIONS **(5 X 2 = 10M)**

1. Define - (i) Stress and (ii) Ductility

(CO1) [Knowledge]

2. Compute the change in length (in mm) for the uniformly tapering bar of circular cross section subjected to a load of 350N as shown in figure:



The Young's Modulus for the material of the bar may be taken as 2.1×10^5 MPa

(CO1) [Knowledge]

3. A brass bar of circular c/s has a diameter of 40mm and is subjected to an axial load of 150kN. The elastic limit of the material is 170 N/mm². Is Hooke's law applicable for the material under the given load? Justify your answer.

(CO1) [Knowledge]

4. A circular member of length 1m is made up of steel and has a diameter of 150mm. Determine the intensity of stress developed in the member if it is subjected to a tensile load of 100kN.

(CO1) [Knowledge]

5. Compute the deformation in a circular member subjected to a tensile load of 100kN. The member is made up of steel and has a dia. of 150mm while its length is 0.75m. Take Young's Modulus for steel as 2 x 10^5 N/mm²

(CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **(2 X 10 = 20M)**

6. A sample of TMT steel bar to be used for the construction of a mall is sent to our lab for testing. Uniaxial Tension is conducted on the steel sample of diameter 50mm and gauge length 350mm. The results of the test are follows:
a. Load at Elastic Limit – 1500 kN
b. Deformation at 1000 kN load – 2mm
c. Change in diameter at 1000 kN load – 0.1mm
Based on the test conducted and the results listed above, list out the elastic constants of the material that can be determined.
Also, estimate the values of these elastic constants for the given steel material

(CO1) [Comprehension]

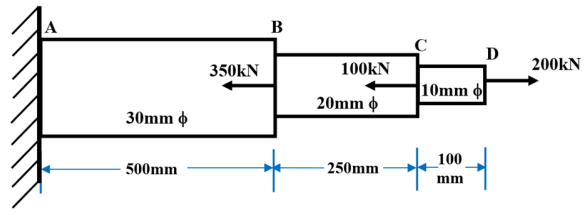
7. A composite bar is made up of a solid brass bar of 60mm diameter and 750mm length encased in an aluminium tube of 80mm inside diameter and 100 mm outside diameter. The ends of the brass bar and aluminium rod are rigidly connected to each other. The composite bar is subjected to an axial pull of 450kN. Sketch the composite bar and determine the stresses developed in the bar and the tube. Take Young's modulus of brass and aluminium as 80GPa and 70GPa respectively.

(CO1) [Comprehension]

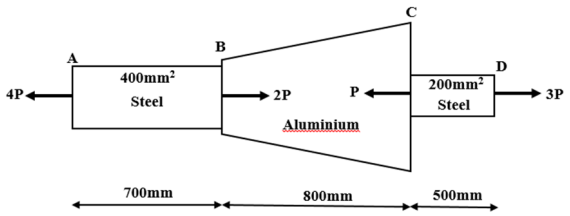
PART C

ANSWER THE FOLLOWING QUESTION **(1 X 20 = 20M)**

8. a) A stepped bar made up of aluminium is subjected to loads as shown in Figure below. Determine
i) The length of the last segment if the deformation in the bar is not to exceed 2mm.
ii) The diameter of the first segment so that the bar length does not change under the applied loads.
Take E = 170GPa
[10 Marks]



b) A stepped compound bar made up of three different sections is subjected to forces as shown in Fig below. For the tapering portion the diameter at the smaller end is 12.5mm while it is 40mm at the bigger end. The principle of superposition is valid for the bar and the modulus of Elasticity for steel and aluminium is 200GPa and 70 GPa respectively. Compute the maximum intensity of P if total deformation of the bar is limited to 1mm. [10 Marks]



(CO1) [Application]