Roll No. _____

END SEMESTER EXAMINATION
SEMESTER-III

COURSE CODE : ME 401 | **DURATION : 3 (THREE)HRS**
COURSE TITLE : Mechanics of Materials | **MAXIMUM MARKS : 75**
SESSION : JULY-DEC'2021 | **PASS MARKS : 35 %**

NOTE:
1. All the questions are compulsory
2. Attempt any 5 (five) questions.
3. Mark for each question is shown against it.
4. Assume suitable logical data wherever necessary.

1. **(a)** Define : (a) Stress (b) Permissible Stress (c) Factor Of Safety (d) Strain **(4)**

(b) Draw the stress-strain diagram for elastic material and explain all the salient points of observation on the curve. **(6)**

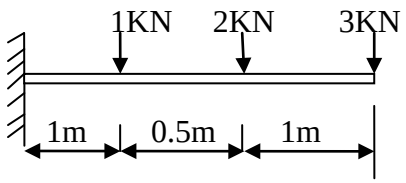
(c) Define the following materials with example; **(5)**
1)Ductile material 2)Brittle material 3)Composite material
4)Isotropic material 5)Orthotropic material

2. **(a)** A circular steel rod of diameter 20 mm and 500 mm long is subjected to tensile force of 45 N. The modulus of elasticity for the steel may be taken as 200 KN/mm. Find the stress, strain and elongation of the bar due to applied load. **(5)**

(b) A tapering rod has diameter d1 at one end and it tapers uniformly to a diameter d2 at the other end in a length L. If modulus of elasticity of the material is E, find its change in length when subjected to an axial force P. **(10)**

3. **(a)** State parallel axis theorem. **(3)**
(b) State Perpendicular axis theorem. **(3)**
(c) Define radius of gyration. **(3)**
(d) Define slenderness ratio. **(3)**
(e) States difference between struts and column. **(3)**

4. **(a)** What are the different types of beam and explain them? **(5)**
(b) A cantilever beam of length 2.5m carries the point loads as shown in fig. draw the SFD and BMD for the cantilever beam? **(10)**



5. **(a)** Derive the Torsional Equation. **(10)**

(b) Calculate the maximum intensity of shear stress induced and angle of twist and produced in degrees in solid shaft of 100 mm diameter, 10 mm long transmitting 112.5kW at 150 rpm. Take G=82 kN/mm^2. **(5)**

6. **(a)** A steel bar of rectangular section 40mm x 50mm pinned at each end is subjected to axial compression. The bar is 2m long. Determine the buckling load and the corresponding axial stress using Euler's formula. Also calculate slenderness ratio if the proportional limit of the material is $200N/mm^2$. Take $E = 2x10^5 N/mm^2$ **(10)**

(b) What is the slenderness ratio of 4m column with fixed end if its cross section is square of side 40mm? **(5)**

7. **(a)** Find the centroid for a T-Section having flange 120mm x 12mm and web 180mm x 18mm. **(5)**

(b) Find the least moment of inertia and polar moment of inertia of a symmetrical I-section having following: **(10)**

i. Flanges = 100mm x 15mm
ii. Web thickness = 10mm
iii. Overall depth = 280mm

8. **(a)** State Slope and Deflection of a beam. **(5)**

(b) A simply supported beam of span 9m carries two point loads 210 kN and 125 kN at 2m and 6m from left support. The self weight of the beam is 26 kN/m. Determine maximum slope and deflection at the centre. EI is constant. **(10)**

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