ROLL NO:	

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 20% Max Marks: 40 Max Time: 1 hr. Tuesday, 25th September, 2018

TEST – 1

Odd Semester 2018-19 Course:**MEC 206 Mechanics of Solids** III Sem. Mechanical

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Instruction:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted.

Part A

(3 Q x 4 M = 12 Marks)

1. A material has modulus of rigidity (G) equal to 0.4×10^5 N/mm^2 and bulk modulus (K) equal to 0.8×10^5 N/mm^2. Find its Young's Modulus (E) and Poisson's Ratio (μ).

2. Draw a typical stress-strain curve for mild steel, indicate salient points and define them.

3. A circular rod of diameter 20 mm and 550 mm long is subjected to a tensile force 70 kN. The modulus of elasticity for steel may be taken as 210 kN/mm^2. Find stress, strain and elongation of the bar due to applied load.

Part B

(2 Q x 8 M = 16 Marks)

4. Determine the stress in each section of the bar shown in figure 1. when subjected to an axial tensile load of 20 kN. The central section is 30 mm square cross-section; the other portions are of circular section, their diameters being indicated. What will be the total extension of the bar? For the bar material E = 210GN/m^2.

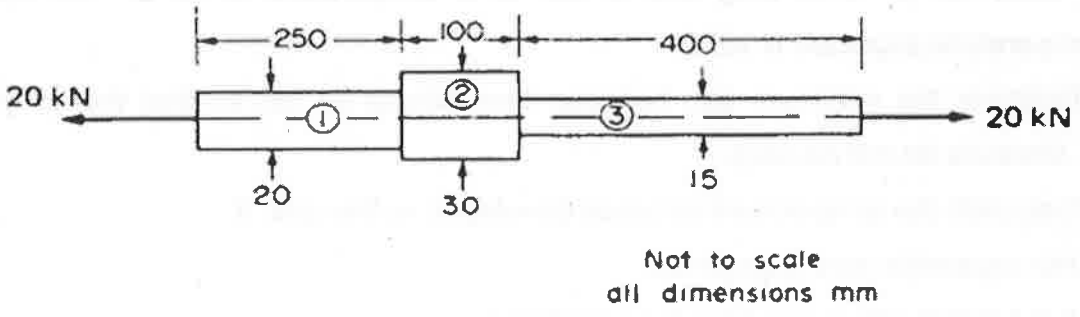


Fig.1

5. A compound bar consists of a circular rod of steel of 35 mm diameter rigidly fixed into a copper tube of internal diameter 35 mm and external diameter 50 mm as shown in figure 2. If the compound bar is subjected to a load of 150 kN, calculate the stresses developed in the two materials.

Take Es = 2 ×10^5 N/mm^2 and Ec = 1.2 × 10^5 N/mm^2.

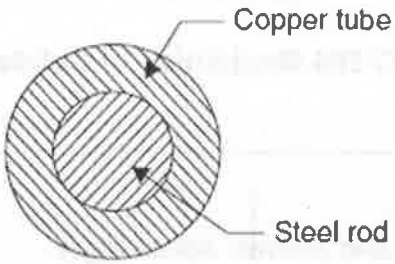


Fig.2

Part C

(1 Q x 12 M = 12 Marks)

6. (a) A bar of uniform thickness *t* tapers uniformly (shown in figure 3) from a width *b*1 at one end to *b*2 at the other end in a length *L*. Find the expression for its extension under an axial pull *P*. **(4 Marks)**

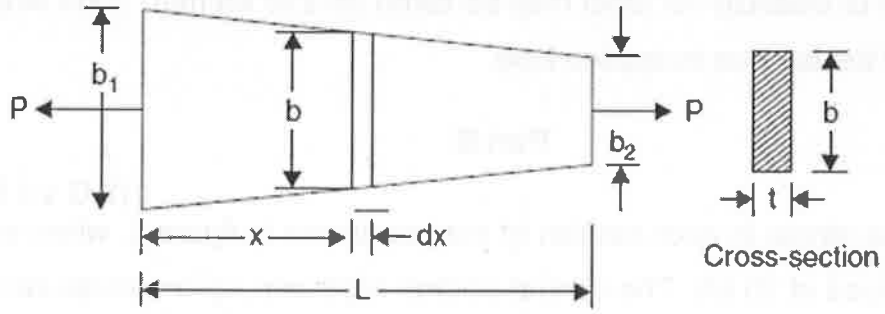


Fig.3

(b) A steel rail is 12 m long and is laid at a temperature of 20°C. The maximum temperature expected is 42°C.

(i) Estimate the minimum gap between two rails to be left so that the temperature stresses do not develop.

(ii) Calculate the temperature stresses developed in the rails, if:

(a) No expansion joint is provided.

(b) If a 1.5 mm gap is provided for expansion.

Take E = 2 × 10^5 N/mm^2 and α = 12 × 10^{-6}/°C. **(8 Marks)**

ROLL NO:

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

TEST 2

Odd Semester: 2018-19 | **Date**: 28 November 2018

Course Code: MEC 206 | **Time**: 1 Hour

Course Name: Mechanics of Solids | **Max Marks**: 40

Branch & Sem: MEC & III Sem | **Weightage**: 20%

Instructions:

(i) Read the question properly and answer accordingly.

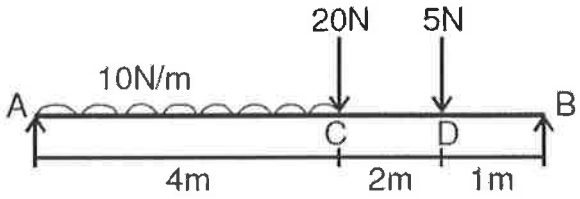
(ii) Question paper consists of 3 parts.

(iii)Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **four** marks. (2x4=8)

1. Calculate support reaction at A and B for given beam.

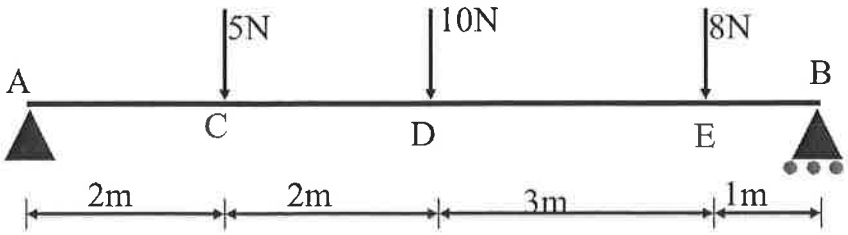


2. Design a timber beam is to carry a load of 10 N/m over a simply supported span of 5 m. Permissible stress in timber is 20 N/mm^2. Keep depth twice the width. Assume maximum bending moment is $\frac{WL^2}{8}$ (where W is the load and L is the span length).

Part B

Answer **all** the Questions. **Each** question carries **ten** marks. (2x10=20)

3. Draw shear force and bending moment diagrams [SFD and BMD] for a simply supported beam subjected to three point loads as shown in the Fig. given below.

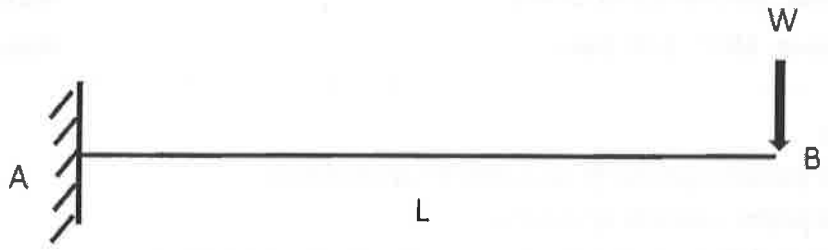


4. Derive the bending equation $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ for simple bending.

Part C

Answer the Question. Question carries **twelve** marks. (1x12=12)

5. Find out the expression for slope and deflection for cantilever beam subjected to point load W at the free end.



Roll No.											

PRESIDENCY UNIVERSITY
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END TERM FINAL EXAMINATION

Odd Semester: 2018-19 | **Date**: 31 December 2018

Course Code: MEC 206 | **Time**: 2 Hours

Course Name: Mechanics of Solids | **Max Marks**: 80

Programme & Sem: MECH & III Sem | **Weightage**: 40%

Instructions:

(i) Read the question properly and answer accordingly.

(ii) Question paper consists of 3 parts.

(iii)Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **five** marks. (4Qx5M=20)

1. What do you understand by pure torsion? Explain briefly.
2. What do you understand by principal planes? Explain.
3. What is a stress tensor? How do you represent stress tensor on a point in 3D?
4. Give the expression of following terms for a solid circular shaft
   A) Polar section Modulus (B) Polar moment of inertia

Part B

Answer **both** the Questions. **Each** question carries **ten** marks. (2Qx10M=20)

5. Derive the expression for normal and shear stress on an oblique plane under axial loading.
6. Derive the torsion equation $\frac{T}{J} = \frac{G\theta}{L} = \frac{\tau}{R}$ for a circular shaft when subjected to torsion.

Part C

Answer **both** the Questions. **Each** question carries **twenty** marks. (2Qx20M=40)

7. 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
   A) The magnitude of Principal Stresses (B) The magnitude of maximum shear stress
8. A) A hollow shaft of external diameter 120 mm transmits 300 kW power at 200 rpm. Determine the maximum internal diameter if the maximum shear stress in the shaft is not to exceed 60 N/mm^2. (15M)
   B) Write down the expression for σ_n and τ_s developed on an oblique plane passing through a point under bi-axial state of stress. (5M)