BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – Dip.CE-2022/Dip.CE-2023
Course Name – Mechanics of Materials
Course Code - DCEPC303
(Semester III)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Determine Area Moment of Inertia of a rectangular shape with base (b) and height (h) about its centroidal axis (Ixg).

a) (1/3)*bh^3 b) (1/12)*bh^3
c) (1/3)*bh^2 d) (1/12)*bh^2

(ii) Determine the larger area moment of inertia about its centroidal axis among circle and square if both have the same area.

a) The circle. b) The square.
c) They will have the same Area Moment of Inertia. d) It cannot be determined.

(iii) State Hooke's law.

a) It states that within proportional limit, stress is directly proportional to strain. b) It describes the behavior of rigid bodies within proportional limit.
c) It is another term for elastic limit. d) It defines plastic deformation within proportional limit.

(iv) Identify the main stress involved in designing a beam.

a) Normal stress b) Direct stress
c) Bending stress d) Shear stress

(v) Identify the type of support in cantilever beam.

a) Roller support b) Pinned support
c) Hinged support d) Fixed support

(vi) Identify the type of force creates a sudden change in the shear force magnitude in a shear force diagram.

a) Point load b) Uniformly distributed load
c) Moment d) No change occurs

(vii) Identify which cross sectional shape has the most uniform shear stress distribution.

a) Rectangular b) Circular

c) Hollow d) Angle

(viii) Identify the unit of stress.

a) N/mm^2 b) KN/mm^2

c) N/m^2 d) All of these

(ix) Name the material which have same elastic properties in all direction.

a) Ideal Materials b) Uniform Materials

c) Isotropic Materials d) Elastic Materials

(x) Determine the mechanical properties which can be obtained through the total area under the stress-strain curve of a mild steel specimen tested up to elastic limit under tension.

a) Resilience b) Toughness

c) Hardness d) Stiffness

(xi) Examine the value of bending moment at a point where shear force is zero at that point.

a) zero b) minimum

c) maximum d) infinity

(xii) Identify the support which has single reaction component.

a) hinge support b) roller support

c) fixed support d) none of these

(xiii) Identify the value of bending moment in case of beams where shear force changes sign .

a) maximum b) zero

c) minimum d) infinity

(xiv) Examine the point of maximum bending moment in a cantilever beam with a uniformly distributed load.

a) At the free end b) At the fixed support

c) At the midpoint of the beam d) Shear force is constant along the beam

(xv) Determine the stress induced in metallic bar if the bar is free to expand.

a) Tensile stress b) Compressive stress

c) Shear stress d) No stress

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Define centroid. (3)
3. Define tensile stress in context of engineering materials. (3)
4. Calculate the value of stress in Mpa of long square bar of 10 cm which was acted upon by external force of 10 KN. (3)
5. Classify beams based on supports. (3)
6. Explain point of contraflexure in case of beam with suitable diagram. (3)

OR

Explain the term Hogging and Sagging in case of bending moment of beam with neat sketch. (3)

Group-C

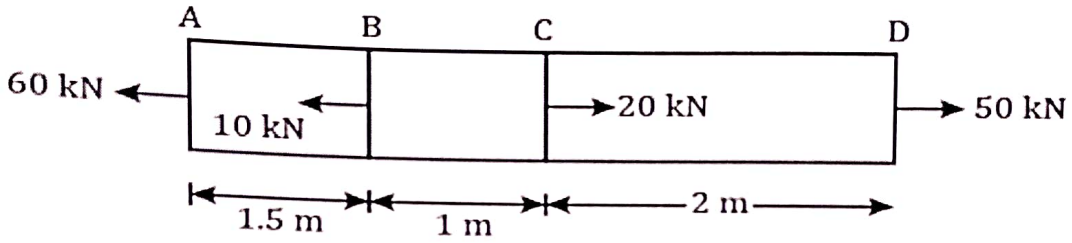
(Long Answer Type Questions) 5 x 6=30

7. Write the different types of Bending Moment with neat sketch. (5)

8. Explain the following terms:- (a) Factor of Safety (b) Resilience (c) Proof Resilience (d) Modulus of Resilience. (5)

9. Explain the following terms:- i) Polar moment of inertia ii) Angle of twist iii) Polar modulus (5)

10. (5)



Analyze the value of force and its nature acting on part BC of the member AD.

11. Determine the thermal stress induced in the rod of 2 m long is held between two walls and heated from 20°C to 60°C. Young's modulus of elasticity (E) and coefficient of linear expression of the rod material are 200 X 10^3 MPa and 10 X 10^-6 /°C respectively. (5)

12. Differentiate between Thermal Stress and Thermal Strain. (5)

OR

Explain the term Coefficient of Thermal Expansion and derive thermal stress formula using coefficient of thermal expansion . (5)

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