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398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125

Term End Examination 2025-2026
Programme – Dip.CE-2024
Course Name – Strength of Materials
Course Code - DCE30104
(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) Define centroid of a geometric shape.
a) The center of geometric shape.
b) The point farthest from the shape's boundary.
c) The highest point on the shape.
d) The point of intersection of diagonals.

(ii) 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.

(iii) Calculate the factor of safety of a steel bar which has an ultimate stress of 600 MPa and subjected to a maximum stress of 200 MPa.
a) 1
b) 2
c) 3
d) 4

(iv) Identify the type of stress a body experiences when a material is subjected to stress in two perpendicular directions.
a) Uniaxial stress
b) Biaxial stress
c) Tri-axial stress
d) No stress

(v) Examine the shape of the bending stress distribution in a beam under pure bending.
a) Uniform
b) Parabolic
c) Linear
d) Exponential

(vi) Identify the stress value of rod when it is free to expand due to heating.
a) Bending Stress
b) Thermal Stress
c) No Stress
d) Compressive Stress

(vii) Compute the value of bending moment at the free end of a cantilever beam.

a) 0
b) minimum
c) maximum
d) average

(viii) Compute the value of bending moment at hinge.

a) zero
b) maximum
c) minimum
d) depends on the loading

(ix) Define the term slenderness ratio in column design.

a) The column's length
b) The column's cross-sectional area
c) The ratio of column length to its radius of gyration
d) The ratio of column diameter to its length

(x) Identify the end conditions which has high effective length for columns in structural analysis.

a) Pinned and hinged
b) Pinned and fixed
c) Fixed and free
d) Free and hinged

(xi) Identify the SI units of Bending moment.

a) kN
b) kN/m
c) kNm
d) km

(xii) Name the property of a material which signifies that it can be drawn into thin wires.

a) Malleability
b) Plasticity
c) Ductility
d) Elasticity

(xiii) Identify the point of maximum shear force in a simply supported beam.

a) At both supports
b) At the midpoint of the beam
c) At one support only
d) Shear force is never maximum in a simply supported beam

(xiv) Write the full form of UDL in case of beam.

a) Uniformly distributed load
b) Uniformly varying load
c) Point load
d) Combination of point load and uniformly varying load.

(xv) Identify the centroid of triangle of base (b) and height (h) about its base.

a) h/2
b) h/3
c) 2h/3
d) h/4

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Group-B

(Short Answer Type Questions) 3 x 5=15

2. Distinguish between centroid and center of gravity. (3)
3. Justify this Statement: Steel is more elastic than rubber. (3)

4. Classify different types of loads in a beam. (3)
5. Interpret the term "Flexural Rigidity" in case of beam. (3)
6. Explain the term Simple Bending or Pure Bending with a neat sketch. (3)

OR

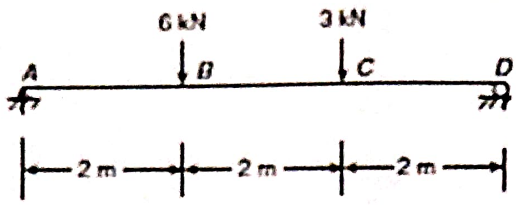
Explain the term Moment of Resistance at any section of a beam. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Calculate the moment of inertia (MOI) of a solid round bar of 3 m long and 5 cm in diameter. (5)

8. Analyze reactions at A and D and bending moment at point B and C in a 6 m long beam ABCD which carries a concentrated loads of 6 kN and 3 kN at B and C as shown in Fig. (5)



9. Explain Rankine theory of column bending with its applications. (5)
10. Explain the following terms: i) Young's Modulus ii) Shear Modulus iii) Bulk Modulus (5)
11. With a neat sketch, illustrate the stress-strain curve of a mild steel. (5)

12. Evaluate 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)

OR

Estimate the value of bulk modulus for the alloy if the values of modulus of elasticity (E) and Poisson's ratio (μ) for an alloy body is 150 GPa and 0.25 respectively. (5)

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