



44055

Library
Brainware University
398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125



BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Tech.(ME)-2024

Course Name – Strength of Materials

Course Code - BTM40106

(Semester IV)

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) Identify the correct range of poisson's ratio for steel
 - a) 0.32 to 0.42
 - b) 0.47 to 0.50
 - c) 0.25 to 0.35
 - d) 0.10 to 0.20
- (ii) Select the physical quantity that has same unit as that of Young's modulus
 - a) strain
 - b) force
 - c) stress
 - d) none of these
- (iii) Identify the material having negative Poisson's ratio.
 - a) anti-rubber
 - b) wood
 - c) concrete
 - d) copper
- (iv) When a shaft is subjected to torsional loading, identify the type of stress is developed.
 - a) Tensile stress
 - b) Compressive stress
 - c) Shear stress
 - d) Bending stress
- (v) State the maximum shear stress for a solid circular shaft with a diameter of D and an applied torque of T.
 - a) $4T / \pi D$
 - b) $2T / \pi D$
 - c) $T / 2\pi D$
 - d) $\pi D / 2T$
- (vi) In Mohr's Circle, the horizontal axis typically represents
 - a) Principal stresses
 - b) Shear stresses
 - c) Normal stresses
 - d) Strain
- (vii) According to Euler's column theory, the critical buckling load of a column is inversely proportional to its _____. (Choose from the following options)
 - a) Length
 - b) Material stiffness
 - c) Cross-sectional area
 - d) Moment of inertia

- (viii) Select the correct option for moment of inertia of an object with respect to a particular axis.
 - a) A measure of its mass
 - b) A measure of its density
 - c) A measure of its resistance to rotation about that axis
 - d) A measure of its linear velocity
- (ix) For a solid circular shaft, predict the formula for calculating the polar moment of inertia.
 - a) $\pi d^2/32$
 - b) $\pi d^4/32$
 - c) $\pi d^2/64$
 - d) $\pi d^4/64$
- (x) Select the unit of polar moment of inertia.
 - a) N/m^2
 - b) $\text{kg}\cdot\text{m}^2$
 - c) m
 - d) $\text{N}\cdot\text{m}$
- (xi) Select the factor that determines the stability of a column in Euler's formula
 - a) Cross-sectional area
 - b) Length
 - c) Material density
 - d) Temperature
- (xii) Estimate the primary reason for applying a safety factor when designing structures or components:
 - a) To make the design more complicated
 - b) To reduce material costs
 - c) To account for uncertainties and variations
 - d) To increase the weight of the structure
- (xiii) Estimate the primary mode of failure in a compression test:
 - a) Tensile
 - b) Shear
 - c) Torsion
 - d) Compression
- (xiv) Choose the term that describes the ability of a material to return to its original shape after deformation:
 - a) Ductility
 - b) Elasticity
 - c) Creep
 - d) Brittleness
- (xv) Choose the measure of a material's ability to absorb energy without breaking:
 - a) Elasticity
 - b) Resilience
 - c) Brittleness
 - d) Toughness

Group-B

(Short Answer Type Questions)

$$3 \times 5 = 15$$

2. Define:- i) Poisson's Ratio ii) Factor of Safety (3)
3. An alloy specimen has a modulus of elasticity of 120 GPa and poisson's ratio of 0.33. Determine the modulus of rigidity. (3)
4. Compare stress and pressure. (3)
5. State Hooke's Law. (3)
6. Illustrate the difference between bending moment and moment of resistance. (3)

OR

Explain the concept of Section Modulus. (3)

Group-C

(Long Answer Type Questions)

$$5 \times 6 = 30$$

7. Justify that, "a square beam is generally stronger than a circular beam when subjected to bending for the same cross-sectional area". (5)
8. Recall the concept of Principal Plane and Principal Stress. (5)
9. State the assumptions of elastic buckling theory. (5)
10. State the assumptions of torsion theory of circular shaft. (5)
11. Explain the failure due to torsion of (a) ductile material shaft (b) brittle material shaft. (5)
12. Illustrate - (i) Torsional Stiffness (ii) Point of contraflexure (5)

OR

Define slenderness ratio. Appraise how stress in the column depends on slenderness ratio. (5)

Library
Brainware University
398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125