S. B. Roll. No.....

STRUCTURAL MECHANICS
4th Exam/Civil/4515/Nov'24
(For 2018 Batch Onwards)

Duration: 3Hrs. **M.Marks:75**

Note: Use of scientific calculator is permitted.

SECTION-A

Q1. Do as directed. **15x1=15**

a. Define Rigidity.
b. Define Bulk modulus.
c. A load acting at a point on a beam is known as_____
d. The bending stress at the neutral axis is _____
e. In case of cantilever beam, the maximum deflection will be at the _____of the beam
f. The ratio between the lateral strain to the longitudinal strain is known as_____
g. Fatigue of a metal is caused by_____
h. The shear stress at a section in a beam varies along_____
i. Impact test is for toughness. (T/F)
j. Hooke's law holds good up to limit of proportionality. (T/F)
k. The unit of moment of inertia of a plane area is in mm^4. (T/F)
l. Buckling load for a column having both ends hinged is minimum. (T/F)
m. The ratio of maximum deflection of a beam to its span is known as _____
n. Define point of contra flexure.
o. Define slenderness ratio.

SECTION-B

Q2. Attempt any six questions. **6x5=30**

i. Define strain. Explain various types of strains.
ii. Discuss the concept of shear stress in beams.
iii. Discuss Elastic materials and Plastic materials.
iv. Explain different types of beams depending upon the end conditions.
v. Write a short note on radius of gyration.
vi. Discuss the concept of Perfect frame and Redundant frame
vii. What is Euler's formula? What are the assumptions made in Euler's theory?
viii. Write a short note on moment of resistance and section modulus.
ix. Define the following terms.
a) Elasticity b) Ductility c) Malleability d) Hardness e) Toughness

SECTION-C

Q3. Attempt any three questions. **3x10=30**

a. Discuss the concept of simple bending. Write the assumptions made in the theory of simple bending.
b. A bar of 20 mm in square cross-section is subjected to a tensile load of 20 kN and the measured extension over a length of 200 mm was found to be 0.20 mm. The contraction in the lateral dimension was 0.006 mm. Determine a) Poisson's ratio b) Young's Modulus of elasticity c) Modulus of rigidity.
c. Discuss the concept of moment of inertia. Also explain the theorem of perpendicular axis.
d. A simply supported beam AB of 16m long carries the concentrated load of 4 kN, 5 kN and 3 kN at distances 3m, 7m and 11m respectively from the left end of the beam. Draw the Shear force diagram and bending moment diagrams for this beam. Also calculate the maximum bending moment.
e. A cantilever beam 8 m long carries a point load of 20 kN at the free end. The width and depth of the beam are 200 mm and 300 mm respectively. Calculate the maximum slope and deflection in the beam when Young's modulus of elasticity, $E = 2 \times 10^5$ N/mm^2.

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