4ᵗʰ Sem. / Civil Engg./ BT/ CM/ HE

Subject : Structural Mechanics

Time : 3 Hrs.   M.M. : 100

SECTION-A

Note: Very Short Answer type questions. Attempt any 15 parts.   (15x2=30)

Q.1 a) Stress

b) Strain

c) Ductile materials

d) Brittle materials

e) Poisson's ratio

f) Hooke law

g) Simply supported beam

h) Roller support

i) Point of contraflexure

j) Radius of gyration

k) Parallel axis theorm

l) Section modulus

m) Slope

n) Deflection

o) Eccentric load

p) Perfect frame

q) Redundant frame

r) Deficient frame

SECTION-B

Note: Short answer type questions. Attempt any ten parts   10x4=40

Q.2 i) Define the term 'load'. How are the loads classified?

ii) Draw a typical stress-strain curve for a mild steel specimen subjected to a tensile force.

iii) Draw the S.F. and B.M. diagrams for a simply supported beam carrying a point load W at its mid span.

iv) Differentiate between overhanging beam and continuous beam.

v) What are the different type of loads acting on beam? Draw neat diagrams.

vi) What is moment of inertia and why is it called second moment of area?

vii) Find the M.O.I of a rectangle of base 20mm and depth 40mm about the base of the rectangle.

viii) What do you mean by strength of a beam section?

ix) Distinguish between direct stress and bending stress.

x) On which factors the strength of a column depend.

xi) What is the necessity for calculating deflection?

xii) State expression (Give formulae) for slope and deflection at the free end of a uniform cantilever beam of length 'l' which carries a u.d.l. of w/unit length over the whole span.

xiii) Write the bending equation. Explain the meaning of various notations used in this equation.

xiv) Write short note on principle stresses.

xv) Explain 'method of joints' for analysis of trusses.

SECTION-C

Note: Long answer type questions. Attempt any three questions. 3x10=30

Q.3 A rod of 2m length and 20mm diameter is subjected to an axial pull of 20KN. Find the (i) Stress (ii) Strain (iii) Elongation of the rod.

Take young's modulus of elasticity of the rod material as $2 \times 10^5 \, N/mm^2$.

Q.4 Draw the S.F.D. and B.M.D. for the given simply supported beam.
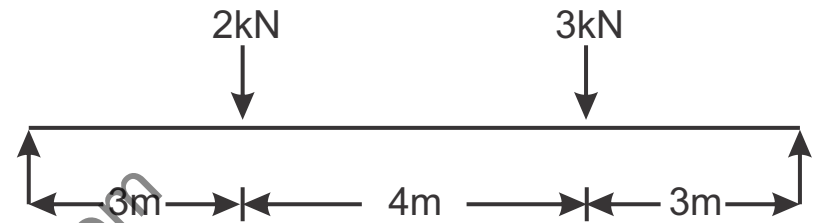
Q.5 Determine the moment of inertia of T-section (100mm x 100mm x 20mm) about the horizontal and vertical axis, passing through the centre of gravity of the section.

Q.6 A rectangular beam 300mm deep and 150mm wide is simply supported over a span 8m. Find the maximum concentrated load at the centre of the beam, that the beam can carry if the bending stress is not to exceed $100 N/mm^2$.

Q.7 A beam is simply supported at both ends on a span of 4m. It carries a u.d.l of 6 KN/m over the whole span. What point load at the centre it should carry so that the maximum deflection is doubled.