Roll no._____ **ID: 170747/030745**

Semester: 4th

Branch: Civil

Subject Name: Structural Mechanics

Time Allowed : 3 Hrs. **MM:100**

Section –A

Note: Multiple Choice questions. All questions are compulsory. **10x1=10**

Q.1 Modulus of rigidity is a ratio between: (CO_2)
a) Shear stress and shear strain
b) Compressive stress and compressive strain
c) Stress and strain
d) None of above

Q.2 The property of material by which it can be drawn into smaller sections by applying tensile load is called. (CO_1)
a) Malleability b) Plasticity
c) Elasticity d) Ductility

Q.3 If n>2J-3, then the frame is: (CO_9)
a) Perfect frame b) Deficient frame
c) Redundant frame d) None of these

Q.4 Equivalent length ℓ in respect of column, one end is hinged and other end is fixed have length L. (CO_8)
a) ℓ=L b) $\ell = \frac{L}{\sqrt{2}}$
c) $\ell = \frac{L}{2}$ d) $L = 2\ell$

Q.5 The product of EI is also known as: (CO_7)
a) Polar moment of inertia b) Flexural rigidity
c) Stiffness d) Modulus of Rigidity

Q.6 The shear stress distribution diagram for a rectangular section is: (CO_6)
a) a parabolic curve b) a triangle
c) a cubic curve d) no fixed shape

Q.7 The moment of inertia of an area is always least with respect to: (CO_4)
a) Centroidal axis b) Vertical axis
c) Radius of gyration d) All of these

Q.8 Shear force in a cantilever beam loaded at the free end is maximum at: (CO_3)
a) Free end b) Fixed end
c) Throughout length d) None of these

Q.9 In S.I. system of units, the units of stress are: (CO_)
a) Kgf/mm^2 b) Kg/mm^2
c) Pa d) N/m^2

Q.10 In case of circular sections, the section modulus is given by: (CO_4)
a) $\frac{\pi d^2}{64}$ b) $\frac{\pi d^2}{16}$
c) $\frac{\pi d^3}{16}$ d) $\frac{\pi d^3}{32}$

Section-B

Note: Objective type questions. All questions are compulsory. **10x1=10**

Q.11 A frame in which n=2j-3 equation is satisfied is called _____ frame. (CO_9)

Q.12 The ratio of equivalent length of column to the least radius of gyration is called _____. (CO_2)

Q.13 The equation $\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$ is known as _____. (CO_5)

Q.14 Mild steel is a _____ material. (Ductile/Brittle) (CO_1)

Q.15 When a body is composed of more than one material, it is called _____. (CO_2)

Q.16 The moment of inertia of a rectangle about the axis passing through centroid is given _____. (CO_4)

Q.17 The point of contraflexure is the point where _____changes sign. (B.M/S.F) (CO_3)

Q.18 In case of cantilever beam, maximum deflection will be at the _____. (CO_7)

Q.19 The shear stress varies along the _____ of the beam. (CO_6)

Q.20 A beam in which end portion is extended beyond the support is known as _____. (CO_3)

Section –C

Note: Short answer type Questions. Attempt any twelve questions out of fifteen questions. 12x5=60

Q.21 Define deficient frame and redundant frame. (CO_9)

Q.22 Calculate the safe working load for a circular steel strut of 6m length and having diameter 80 mm which is linged at both ends. The factor of safety is 4

Take F = 2.1 X 10^5N/mm^2 (CO_8)

Q.23 Define the mechanical properties of materials. (CO_1)

Q.24 A circular steel bar of 20mm diameter carries a tensile load of 30KN. Find the tensile stress in the bar and the elongation in a length of 300mm if Young's Modulus of Elasticity.

E = 2 X 10^5 N/mm^2 (CO_2)

Q.25 State the theorem of Perpendicular axis. (CO_4)

Q.26 Write the assumptions in slope and deflection method. (CO_7)

Q.27 A steel plate of width 40 mm and thickness 12 mm is bent into a circular arc of radius 12m. Determine the maximum stress induced and the bending moment which will produce the maximum stress.

Take E = 2 X 10^5 N/mm^2 (CO_5)

Q.28 Define the types of Beam. (CO_2)

Q.29 Find the moment of Inertia of T-section having dimensions 100 X 100 X 10 mm as shown in Figure-1. (CO_4)

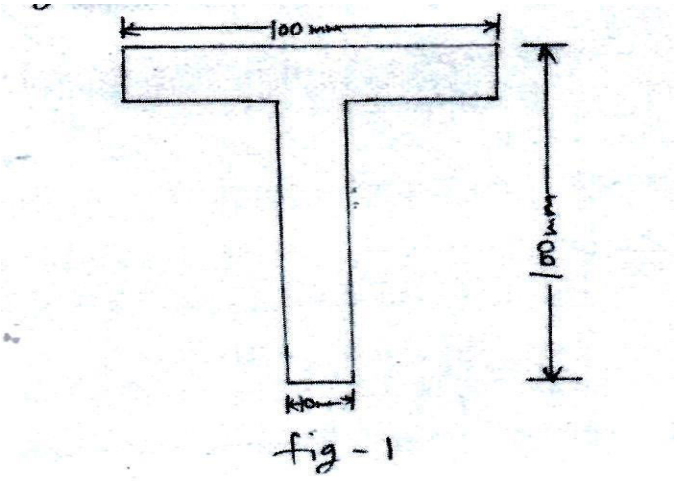


fig - 1

Q.30 Write the properties of An Ideal column. (CO_8)

Q.31 What is bending moment and Point of Contraflexure? Describe briefly. (CO_7)

Q.32 A beam 80 mm wide and 120 mm deep is simply supported over a span of 4m. If shear force at a section of the beam is 5000N. Calculate

a) Average shear stress

b) Maximum shear stress

c) Shear stress at a distance 30 mm above the neutral axis.

Q.33 Calculate the safe working load for a circular steel strut of 6m length and having diameter 80 mm which is hinged at both ends. The factor of safety is 4.

Take E = 2.1 X 10^5 N/mm^2 (CO_8)

Q.34 Derive the bending equation. (CO_5)

Q.35 Drive temperature stresses and strains. (CO_2)

Section-D

Note: Long answer type questions. Attempt any two questions out of three questions. (CO_3) **2x10=20**

Q.36 A simply supported beam AB of span 7m carries point loads of 3,4,3 and 12KN as shown in Fig.2. Draw the shear force and bending moment diagram.

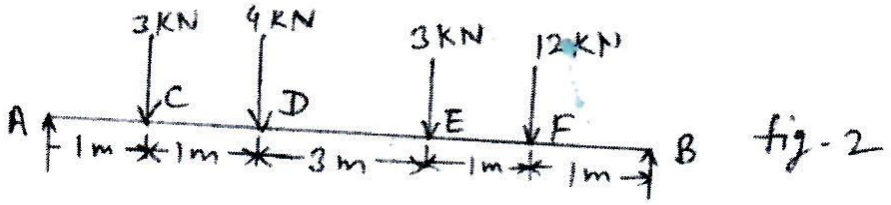
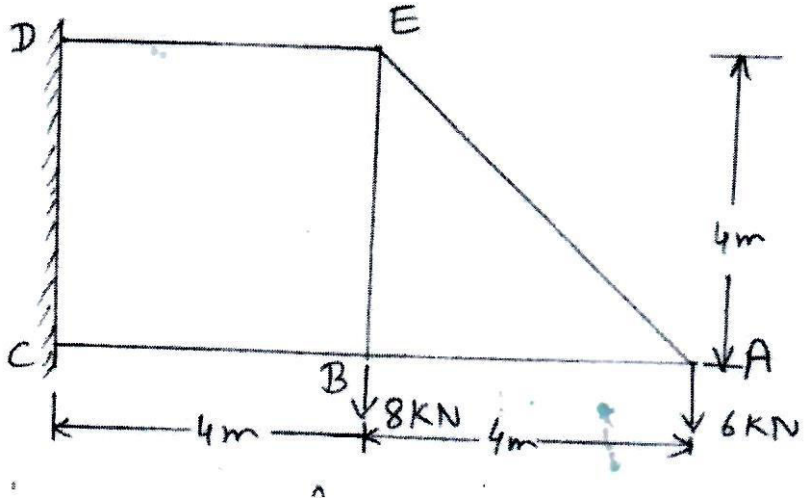


fig - 2

Q.37 By the method of joints, find magnitude and direction of the forces in the any three members of the given cantilever truss as shown in fig.3.



Q.38 A bar 300 mm long is 50 X 50 mm in section for 120 mm of its length, 20 mm dia for 80 mm length and 40 mm diameter for the remaining length. If the tensile force of 80 KN is applied to the bar. Calculate the stresses induced in the different sections and total elongation of the bar.

Take $E = 2 \times 10^5$ N/mm^2