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180732/120732

**3rd Sem./ Civil Engineering/Highway Engg.**  
**Subject : Structural Mechanics**

Time : 3 Hrs.

M.M. : 100

**SECTION-A**

**Note:** Multiple choice Questions. All questions are compulsory  
(10x1=10)

- Q.1 The ability of a material to deform without breaking is called (CO-1)  
a) Plasticity                      b) Elasticity  
c) Creep                          d) None of these
- Q.2 The ratio of the lateral strain to the linear strain is called (CO-2)  
a) Poisson's ratio  
b) Bulk modulus  
c) Modulus of elasticity  
d) Modulus of rigidity
- Q.3 The rate of change of bending moment is equal to (CO-3)  
a) Slope                          b) Deflection  
c) Shear force                  d) Poisson's ratio
- Q.4 The moment of inertia of an area is always least with respect to (CO-4)  
a) Bottom most axis              b) Vertical axis  
c) Radius of gyration              d) Centroidal axis
- Q.5 When a simply supported beam is loaded transversely, the maximum tensile stress is developed on the (CO-5)  
a) Neutral Axis  
b) Top layer  
c) Bottom layer  
d) Every cross-section

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- Q.6 The ratio of the average shear stress to maximum shear stress for a circular section. (CO-6)  
a)  $\frac{2}{3}$                                   b)  $\frac{3}{2}$   
c) 2                                      d)  $\frac{3}{4}$
- Q.7 A column that fails due to direct stress is called (CO-8)  
a) Long Column                      b) Short Column  
c) Slender Column                  d) Medium Column
- Q.8 The Rankine formula holds good for (CO-8)  
a) Long Column  
b) Short Column  
c) Medium Column  
d) Both short and long column
- Q.9 Conditions of equilibrium are (CO-9)  
a)  $\Sigma V=0, \Sigma H \neq 0, \Sigma M=0$   
b)  $\Sigma V=0, \Sigma H=0, \Sigma M \neq 0$   
c)  $\Sigma V=0, \Sigma H=0, \Sigma M=0$   
d)  $\Sigma V \neq 0, \Sigma H=0, \Sigma M=0$
- Q.10 If  $n > (2j-3)$ , the frame will be (CO-9)  
a) Perfect frame                      b) Deficient frame  
c) Redundant frame                  d) None of these

**SECTION-B**

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

- Q.11 The tensile strength of brittle material is much \_\_\_\_\_ than their compressive strength (CO-1)
- Q.12 Toughness of metals decreases by heating. (True/False) (CO-1)
- Q.13 The ratio of the change of dimension to the original dimension is known as \_\_\_\_\_ (CO-2)
- Q.14 \_\_\_\_\_ is defined as the algebraic sum of all the vertical forces acting on one side of the section (CO-3)
- Q.15 Units of radius of gyration is \_\_\_\_\_ (CO-4)
- Q.16 Moment of resistance = \_\_\_\_\_ X section modulus (CO-5)
- Q.17 The stress caused by the shearing force at a section of a beam is called \_\_\_\_\_ (CO-6)

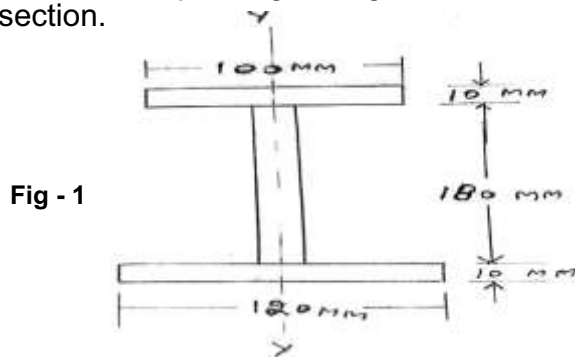
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- Q.18 The distance between adjacent points of inflexion is called \_\_\_\_\_ length. (CO-8)
- Q.19 The maximum limiting load at which the column tends to have lateral displacement is called \_\_\_\_\_. (CO-8)
- Q.20 A frame in which,  $n=2j-3$  equation satisfied is known as \_\_\_\_\_. (CO-9)

### SECTION-C

- Note:** Short answer type questions. Attempt any twelve questions out of fifteen questions. (12x5=60)
- Q.21 Write classification of materials and explain any one of them in detail. (CO-1)
- Q.22 State and explain the Hook's law. (CO-2)
- Q.23 Write and derive the expression for deformation of a body due to self-weight. (CO-2)
- Q.24 Draw the stress-strain diagram for mild steel and mention briefly its salient features. (CO-2)
- Q.25 Write down the points to be considered for drawing the shear force and bending moment diagrams. (CO-3)
- Q.26 Write the name of the different types of beams along with their diagrams. (CO-3)
- Q.27 Calculate the BM and draw BMD for a cantilever beam carrying UDL over the whole span. (CO-3)
- Q.28 Find the moment of inertia of I-section as shown in fig-1 about vertical axis passing through the center of gravity of the section. (CO-4)



- Q.29 Write the assumption made in the theory of simple bending. (CO-5)

- Q.30 A steel plate of width 60mm and of thickness 10mm bent into a circular arc of radius 10m. Determine the maximum stress induced. Take  $E=2 \times 10^5 \text{ N/mm}^2$  (CO-5)
- Q.31 Draw the detailed shear stress distribution diagram for a rectangular section. (CO-6)
- Q.32 A simply supported beam of length 5m carries a UDL of 9kN/m over the entire length. It also carries a concentrated load of 20kN at the center of span. Calculate the maximum deflection of the beam (CO-7)
- Q.33 Derive the expression for maximum slope and deflection for a simply supported beam carrying a UDL. (CO-7)
- Q.34 Write the different end conditions of a loaded column along with their diagrams. (CO-8)
- Q.35 Write the assumptions made in finding out the forces in a frame. (CO-9)

### SECTION-D

- Note:** Long answer type questions. Attempt any two out of three questions. (2x10=20)
- Q.36 A brass bar, having cross-sectional area of 900mm<sup>2</sup>, is subjected to axial forces as shown in fig.-2, Find the total change in length of the bar. Take  $E=1 \times 10^5 \text{ N/mm}^2$  (CO-2)

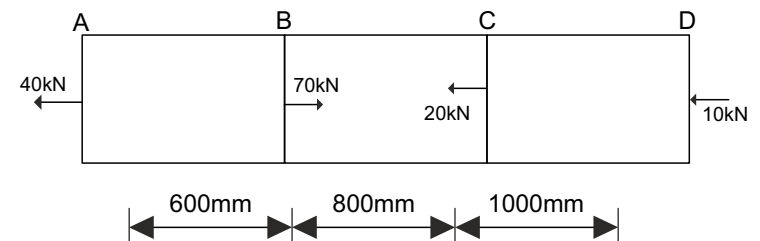


fig. 2

- Q.37 A simply supported beam is carrying a UDL of 2.5kN/m over a length of 2.5m from the right end. The length of the beam is 5 m. Draw the SF and BM diagrams for the beam (CO-3)
- Q.38 Explain the different types of end supports of a beam along-with their neat sketches. (CO-3)

(Note: Course outcome/CO is for office use only)