'I' Scheme

Sample Question Paper

Program Name : **Civil Engineering Program Group**
Program Code : **CE/CR/CS**
Semester : **Third**
Course Title : **Mechanics of Structures**
Max. Marks : **70** **Time: 3 Hours**

22303

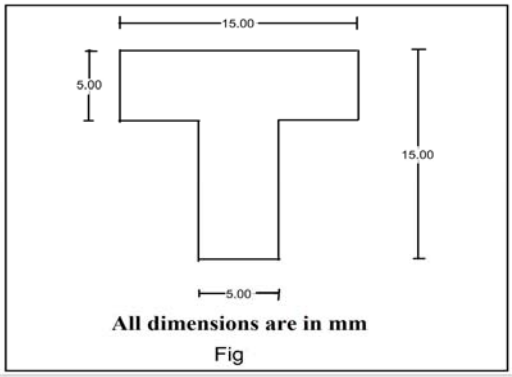
Instructions:
(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.
(5) Preferably, write the answers in sequential order.
(6) Use of nonprogrammable calculator is permissible

Q.1 Attempt any FIVE of the following. **10 Marks**

a. Giving expression, define Hook's law.
b. Define strain energy and Modulus of resilience.
c. Calculate Modulus of rigidity for a member having $E=2\times10^5 N/mm^2$ and $\mu=0.25$
d. Define volumetric strain along with its expression.
e. Determine maximum Shear Force and maximum Bending Moment for cantilever having 3 m span carrying u.d.l. of intensity 20 kN/m
f. Give relation between average and maximum shear stress for rectangular and circular cross-section.
g. Along with expression define slenderness ratio.

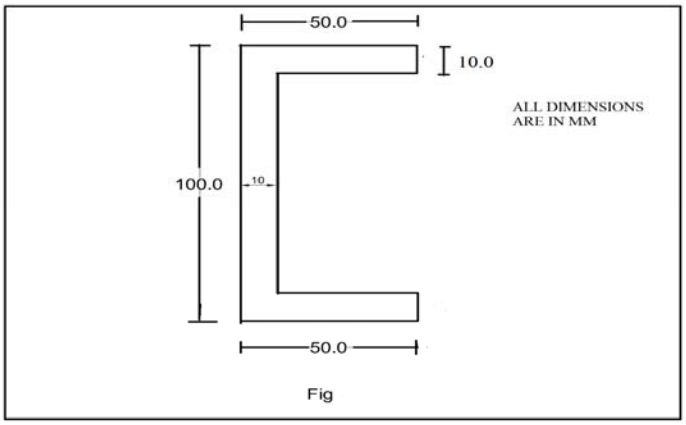
Q.2 Attempt any THREE of the following. **12 Marks**

a. Along with expression state parallel axis theorem and perpendicular axis theorem
b. Determine MI about both the axis for a semicircle and quarter circle having 300 mm as diameter.
c. Calculate the moment of inertia of a T-section about both the axis passing through the centre of gravity for a section as shown in Figure no 1.



Fig

d. Calculate MI for following section



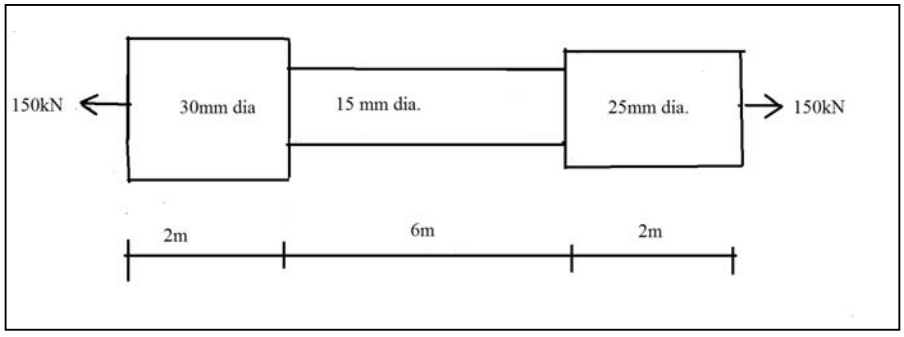
Fig

Q.3) Attempt any THREE of the following. 12 Marks

a. A circular bar of 20 mm diameter and 3m long is subjected to a tensile load of 50kN shows an elongation of 65mm. Determine stress, stain and Modulus of elasticity.

b. A bar 4m long is fixed at one end and there is a gap of 2mm between the other end and the support. Calculate the stress induced if it is heated through i) 25^0 c and ii)50^0 c if $\alpha = 12\times10^{-6}/^0$c.

c. A bar having cross section as given in fig is subjected to a tensile load of 150kN Calculate the change in length of each part along with the total change in length if $E=2\times10^5 N/mm^2$.



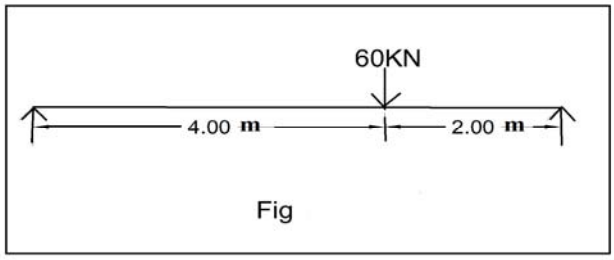
d. A steel tube 40mm as external diameter and 30mm in internal diameter is infilled with concrete. If the assembly is 2m long and has to carry a compressive load of 250 kN calculate the stress induced in each material.

Q.4) Attempt any THREE of the following. 12 Marks

a. For a certain material if $E=2\times10^5 N/mm^2$ and $G=8\times10^4 N/mm^2$, determine μ and K

b. A cube of 120mm side is subjected to a direct load of 48 kN on all faces. Determine change in volume if E=200Gpa and 1/m=0.25.

c. Draw S.F.D. and B.M.D. for a simply supported beam as shown in figure



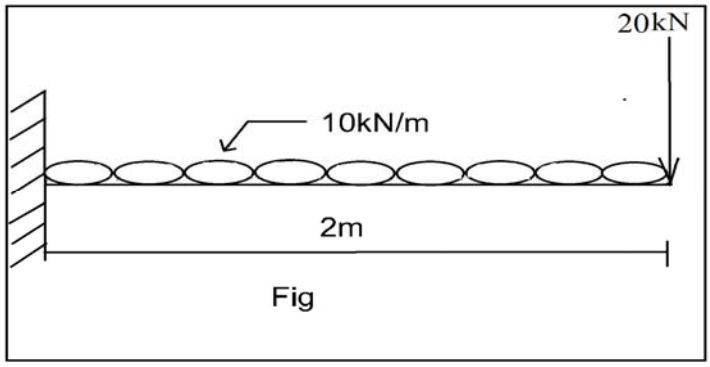
Fig

d. A cast iron column 4m long with both ends fixed carries a safe compressive load of 800 KN. Using Euler's equation, calculate the diameter of column. Take $E=2X10^5$ N/mm^2 and Factor of safety = 4.

e. A 3m long hollow circular column with 200 mm as external diameter and 150mm as internal diameter is fixed at both the ends. Determine the Rankine's crippling load if $\alpha = \frac{1}{7500}$ and fc=320N/mm

Q.5) Attempt any TWO of the following. **12 Marks**

a. Draw S.F. and B.M. diagram for the cantilever beam as shown in fig



Fig

b. Draw S.F. and B.M. diagram for the simply supported beam as shown in fig

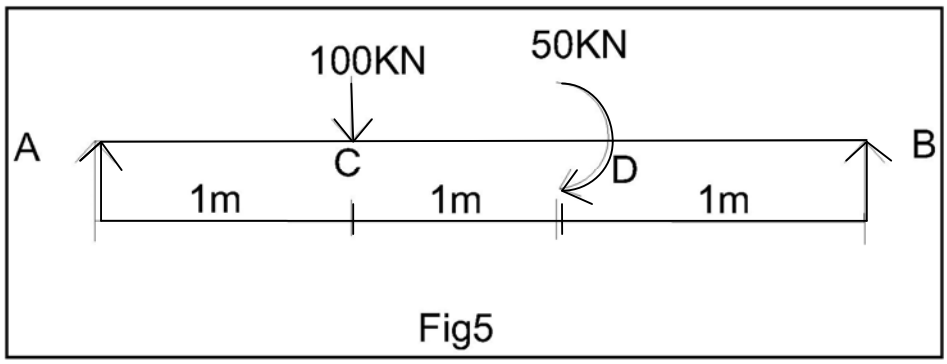
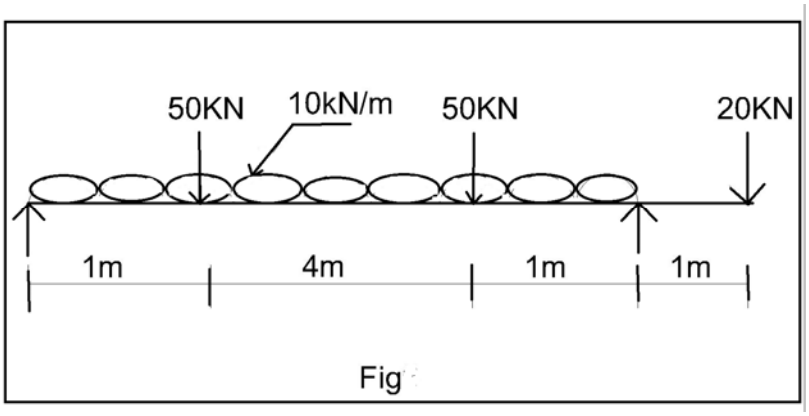


Fig5

c. Draw S.F. and B.M. diagram for the overhang beam as shown in fig



Fig

Q.6) Attempt any TWO of the following. **12 Marks**

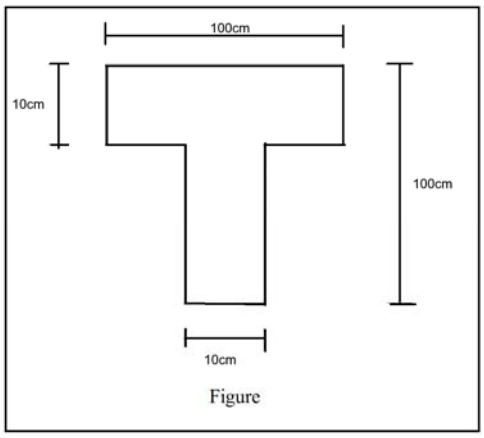
a. Solve the following

i) A simply supported beam has span 8m carries a point load of 50 kN at the centre of the beam. Calculate the modulus of section if bending stress is not to exceed 150Mpa, along with stress distribution diagram.

ii) A rectangular beam having cross-section 100 × 200 mm deep is subjected to a shear force of 20 kN. Find the shear stress at

1. the top layer,
2. The neutral axis
3. average value of shear stress

b. A cantilever is 2m long and is subjected to a u.d.l. of 2kN/m. The cross-section of a cantilever is a tee section as shown in fig no .Determine the maximum tensile and compressive stress developed and their position, showing stress distribution diagram.



Figure

c. A hollow rectangular beam having 10 mm uniform thickness and external dimensions as 70 × 120 mm is subjected to a shear force of 70 kN. Determine the ratio of maximum shear stress to average shear stress along with the stress distribution diagram.

'I' Scheme

Sample Test Paper - I

Program Name : **Civil Engineering Program Group**

Program Code : **CE/CR/CS**

Semester : **Third**

22303

Course Title : **Mechanics of Structures**

Max. Marks : **20** **Time: 1 Hour**

Instructions:

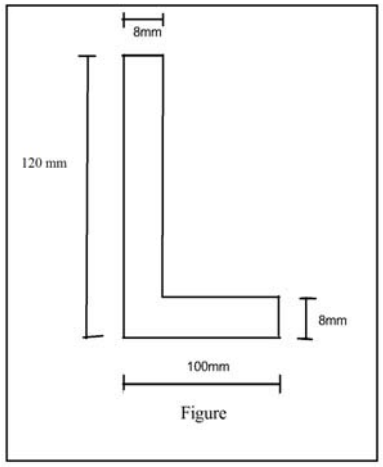
(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.
(5) Preferably, write the answers in sequential order.
(6) Use of nonprogrammable calculator is permissible

Q.1 Attempt any FOUR. **08 Marks**

a) Define M.I. giving its S.I. unit
b) State the M.I. of a triangular section about its horizontal axis passing through C.G.
c) Define elasticity and elastic limit.
d) Define shear stress and shear strain.
e) Define linear strain and lateral strain.
f) Define Bulk modulus giving its expression.

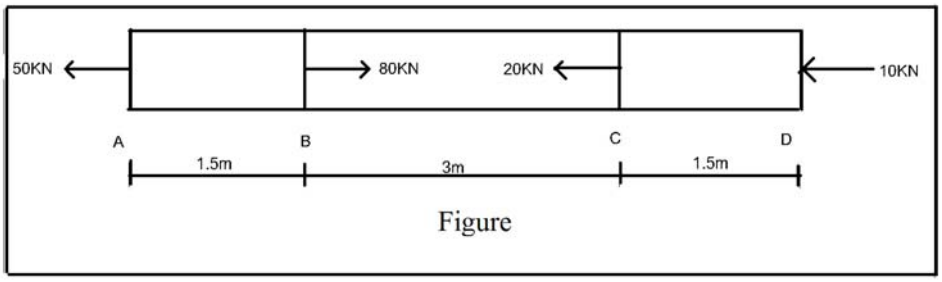
Q.2 Attempt any THREE. **12 Marks**

a) Determine the M.I. about both axis for an angle section as shown in figure



Figure

b) A steel bar having cross section area of 800 mm is subjected to an axial forces as shown in figure .Find the change in length for each part and total change in length of the bar.



Figure

c) A punch of 16mm diameter is used to punch a hole in a plate of 25mm thickness. The ultimate punching shear stress in the plate material is 300N/mm^2. Determine the force required for punching and compressive stress in the punch.

d) In a biaxial stress system, the stresses along two perpendicular directions 70 N/mm^2 tensile in nature and 40 N/mm^2 compressive in nature. Calculate the strains along these two directions. Consider E=200Gpa and μ=0.25.

'I' Scheme

Sample Test Paper - II

Program Name : **Civil Engineering Program Group**
Program Code : **CE/CR/CS**
Semester : **Third**
Course Title : **Mechanics of Structures**
Max. Marks : **20** **Time: 1 Hour**

22303

Instructions:
(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.
(5) Preferably, write the answers in sequential order.
(6) Use of nonprogrammable calculator is permissible

Q.1 Attempt any FOUR. **08 Marks**

a) Define a point of contra flexure.

b) A simply supported beam of span Lm has to carry a u.d.l. of w kN/m throughout the span. Calculate maximum S.F. and B.M. induced.

c) State any four assumptions made in the theory of simple bending.

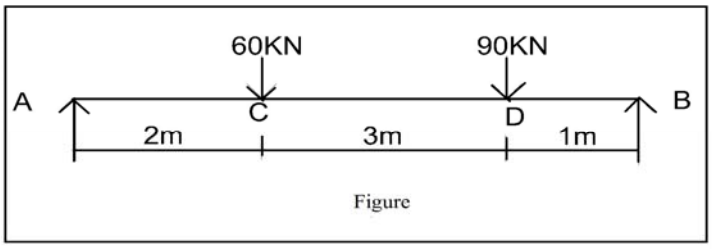
d) Sketch shear stress distribution diagram for hollow rectangular section.

e) Define effective length of column and slenderness ratio.

f) For any two condition of column state effective length.

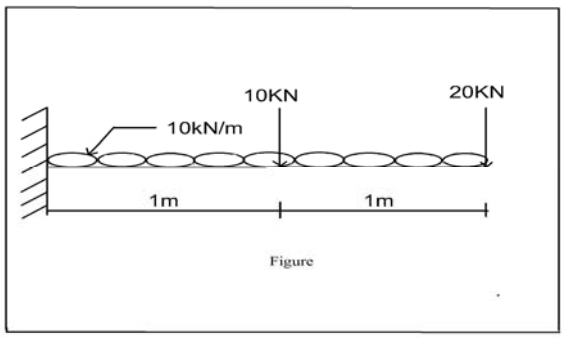
Q.2 Attempt any THREE. **12 Marks**

a) Plot S.F.D. and B.M.D. for a simply supported beam as shown in figure.



Figure

b) Plot S.F.D. and B.M.D. for a cantilever beam as shown in figure



Figure

c) A simply supported beam 150×300 mm deep has span of 4m.It carries u.d.l. of 10kN/m throughout the span. Find minimum and maximum stresses induced in the section.

d) A steel column 30mm in diameter has to carry a load of 250 kN with one end fixed and other end hinged. Determine the length of column using Euler's formula. Take $E=2\times10^5 N/mm^2$.