

Following Paper ID and Roll No. to be filled in your Answer Book.

Roll  
No.

(Even Semester)

*[Maximum Marks : 60]*

## SECTION-A

1. Attempt all parts of the following :  $8 \times 1 = 8$
- (a) What do you mean by resolution of a force?
  - (b) Define limiting friction.
  - (c) Define shear force and bending moment.
  - (d) What relationship exists between the number of joints  $J$  and number of member  $M$  in a simple truss.
  - (e) Define centroid of an area.

[P. T. O.]



- (f) Define force, momentum and impulse.
- (g) Write the relation between modulus of elasticity and modulus of rigidity.
- (h) Define Poisson's ratio.

### SECTION - B

2. Attempt any two parts of the following:  $2 \times 6 = 12$

- (a) Two smooth spheres each of weight  $W$  and each of radius ' $r$ ' are in equilibrium in a horizontal channel of width ' $b$ ' ( $b < 4r$ ) and vertical sides as shown in figure (i). Find the three reactions from the sides of channel which are all smooth. Also find the force exerted by each sphere on the other.

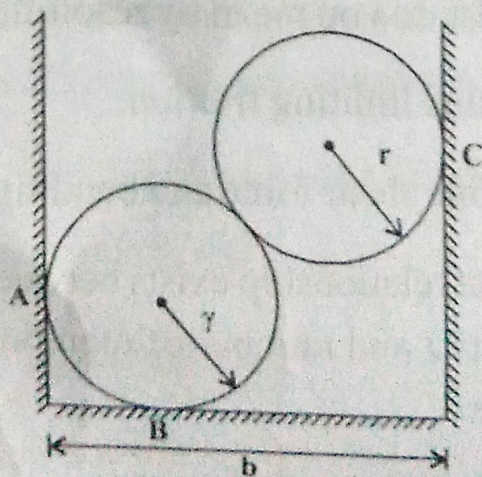


Figure (i)



- (b) Draw the shear force and bending moment diagram for the beam loaded as shown in figure (ii) :

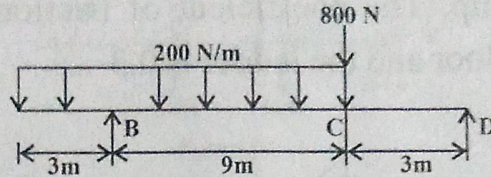


Figure (ii)

- (c) Show that the moment of inertia of a triangular section about its base is equal to  $\frac{bh^3}{12}$ , where  $b$  and  $h$  are base and height of the triangular section respectively.
- (d) A steelbar subjected to loads as shown in figure (iii). Determine the change in length of the bar ABCD of  $10 \text{ cm}$  diameter.  
 $E = 180 \text{ kN/mm}^2$ .

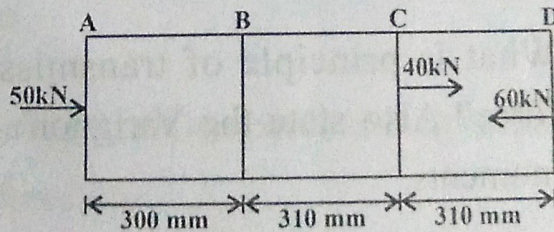


Figure (iii)

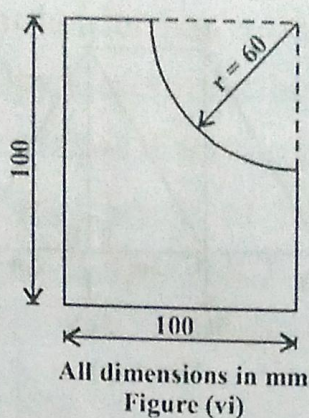
### SECTION - C

**Note :-** Attempt all questions. Attempt any two parts from each question.

$5 \times 8 = 40$

[P. T. O.]





- (c) Define moment of inertia and also prove parallel axis theorem.
6. (a) Draw the stress-strain diagram of ductile material with proper explanation.
- (b) Calculate the strain energy stored in a 3-m long bar of 50 mm side square cross-section, if it is subjected to a load of 50 kN. Take  $E = 200$  GPa.
- (c) An aluminium rod of length 1200 mm and cross-section area  $400 \text{ mm}^2$  is found to elongate by 1.5 mm when subjected to an axial pull of 35 kN. Determine the modulus of elasticity for aluminium.

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