

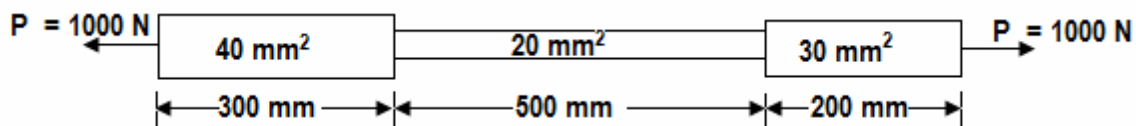
## Strength of Materials (ME-302)

### ASSIGNMENT – I

Q. 1 Define the following mechanical properties-  
Strength, Toughness, Hardness, Creep, Fatigue

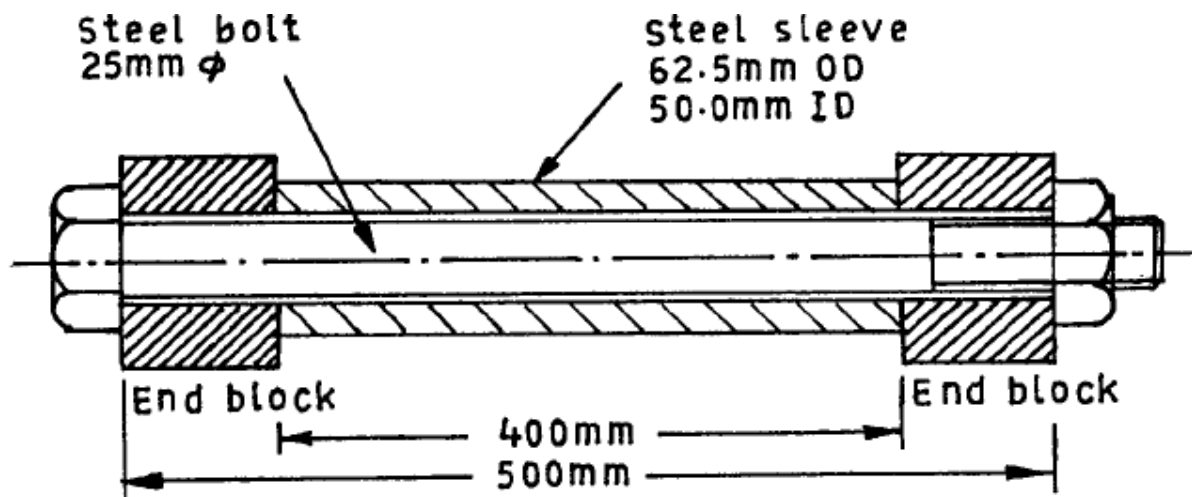
Q. 2 Draw the stress-strain diagram for brittle material.

Q. 3 A composite rod is 1000 mm long, its two ends are  $40 \text{ mm}^2$  and  $30 \text{ mm}^2$  in area and length are 300 mm and 200 mm respectively. The middle portion of the rod is  $20 \text{ mm}^2$  in area and 500 mm long. If the rod is subjected to an axial tensile load of 1000 N, find its total elongation. ( $E = 200 \text{ GPa}$ ).



Q. 4 Young's modulus of elasticity and Poisson's ratio of a material are  $1.25 \times 10^5 \text{ MPa}$  and 0.34 respectively. The modulus of rigidity of the material is:

Q. 5 A steel bolt and sleeve assembly is shown in figure below. The nut is tightened up on the tube through the rigid end blocks until the tensile force in the bolt is 40 kN. If an external load 30 kN is then applied to the end blocks, tending to pull them apart, estimate the resulting force in the bolt and sleeve.



UNIT NO. 2

**Q.1** Determine the dimension of joist of a timber for span 8 m to carry a brick wall 200 mm thick and 5 m high, if the density of brick work is  $1850 \text{ kg/m}^3$  and the maximum permissible stress is limited to  $7.5 \text{ MN/m}^2$ . Given that the depth of joist is twice the width.

**Q.2** A close coiled helical spring is to have a stiffness of  $900 \text{ N/m}$  in compression, with a maximum load of  $45 \text{ N}$  and a maximum shearing stress of  $120 \text{ N/mm}^2$ . The solid length of the spring (i.e. coils touching) is  $45 \text{ mm}$ . Find:

- (i) The wire diameter,
- (ii) The mean coil radius, and
- (iii) The number of coils.

Take modulus of rigidity of material of the spring =  $0.4 \times 10^5 \text{ N/mm}^2$ .