QP Code : 723704

(3 Hours) **[Total Marks : 80**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** questions from remaining **five**.
(3) Assume suitable data wherever necessary.

1. Solve any **four** questions :– **20**

(a) Explain the types of stresses.

(b) A plane element is subjected to the stress as shown in the fig. 1b. Determine analytically
(i) The principle stresses and their directions
(ii) Normal and shearing stress on the inclined plane.

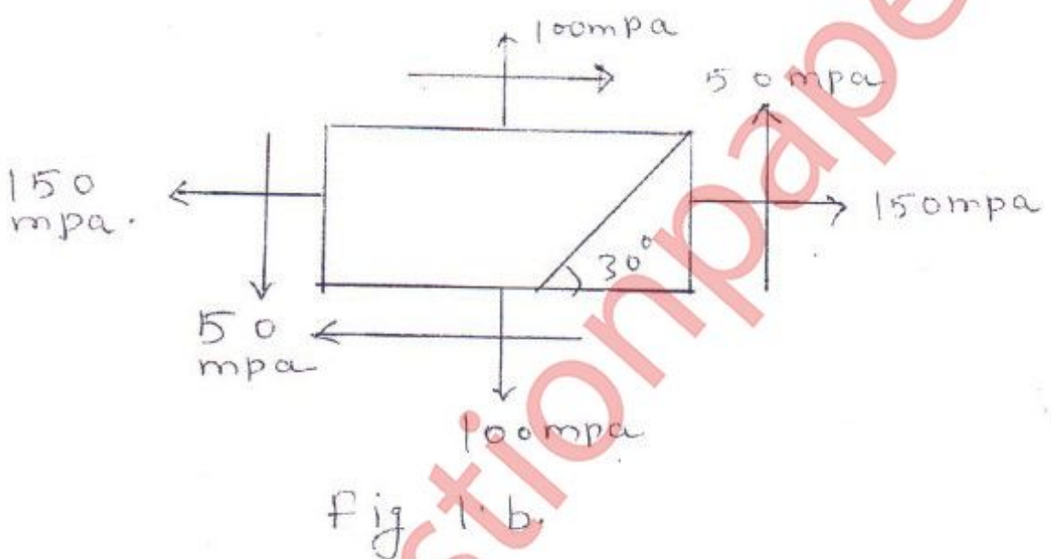

fig 1.b.

(c) Draw S.F.D. and B.M.D. for the loaded beam as shown in fig. 1c.

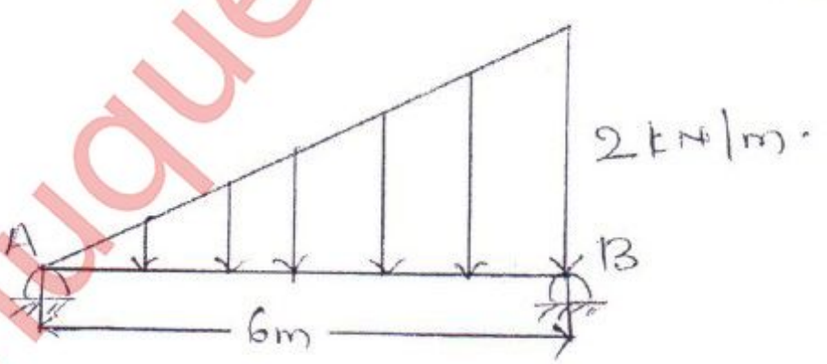

fig 1.c

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(d) Explain the theory of simple bending.

(e) Explain the use of conjugate beam method over other methods.

2. (a) Determine the diameter of the shaft to transmit 1MW rotating at 220 RPM and the working conditions to be satisfied are : **10**

(i) That the shaft must not twist more than 1° on length of 12 diameters and

(ii) The shear stress must not exceed 60 N/mm^2. Take G = 84 KN/mm^2.

(b) For the beam loaded at shown in the fig. 2b find slopes at A and B and deflections at C and D. Also find the position and value of maximum deflection in the beam by Macaulay's method. Take E = 2 × 10^5 N/mm^2 E = 1 × 10^8 mm^4. **10**

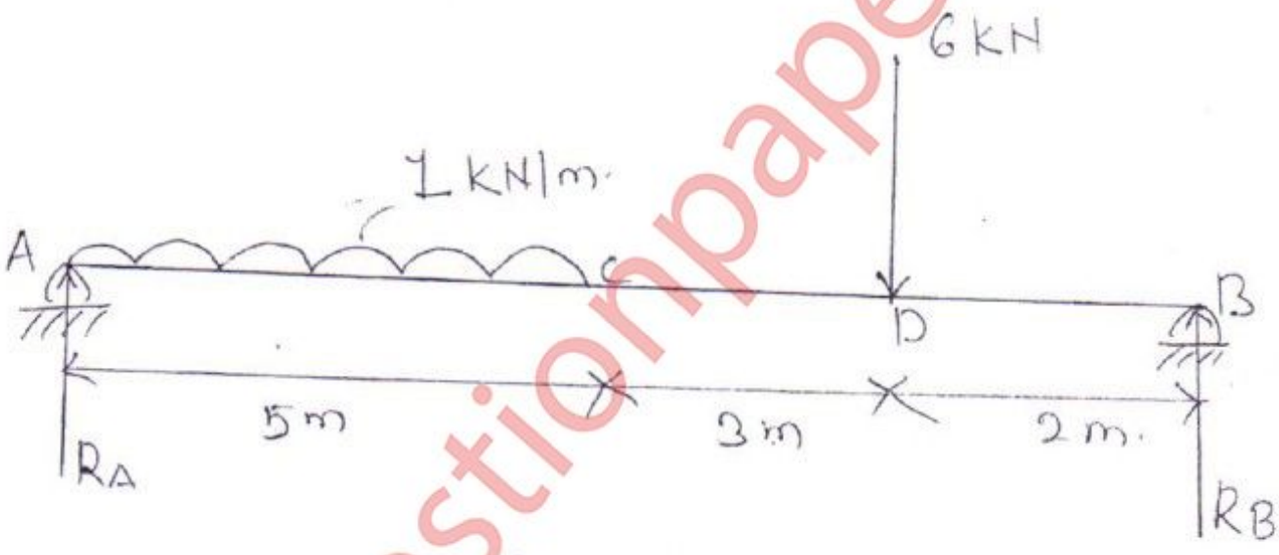


Fig 2b.

3. (a) A cast iron beam is of I-sections as shown in fig. 3a. The beam is simply supported on a span of 5 meters. If the tensile stress is not to exceed 20 N/mm^2. Find the safe uniform load which the beam can carry. Find also the maximum compressive stress. **10**

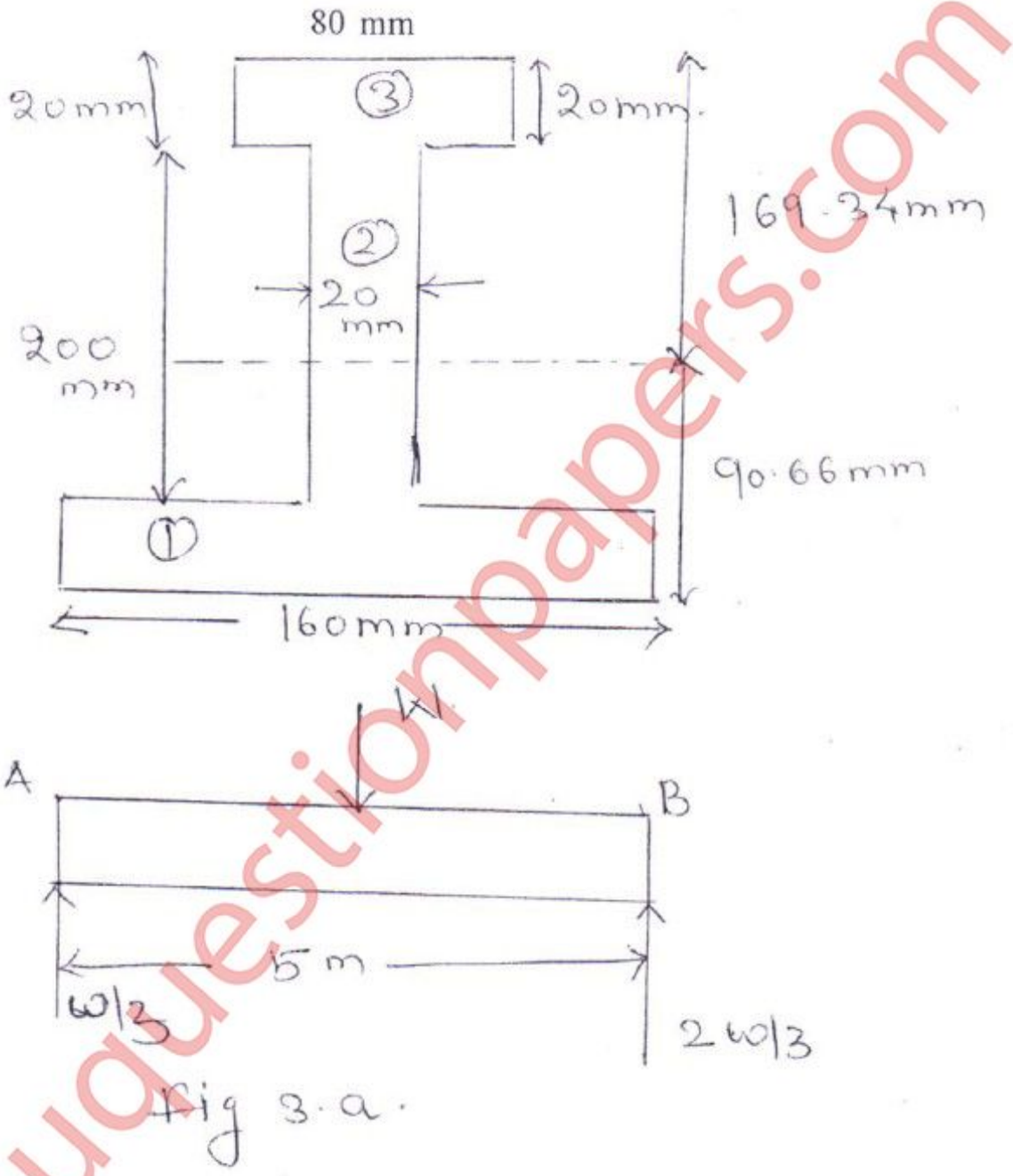


Fig 3.a.

(b) Draw SFD, BMD and AFD for the following beam as shown in the fig. 3b and also show the point of contraflexure if any. **10**

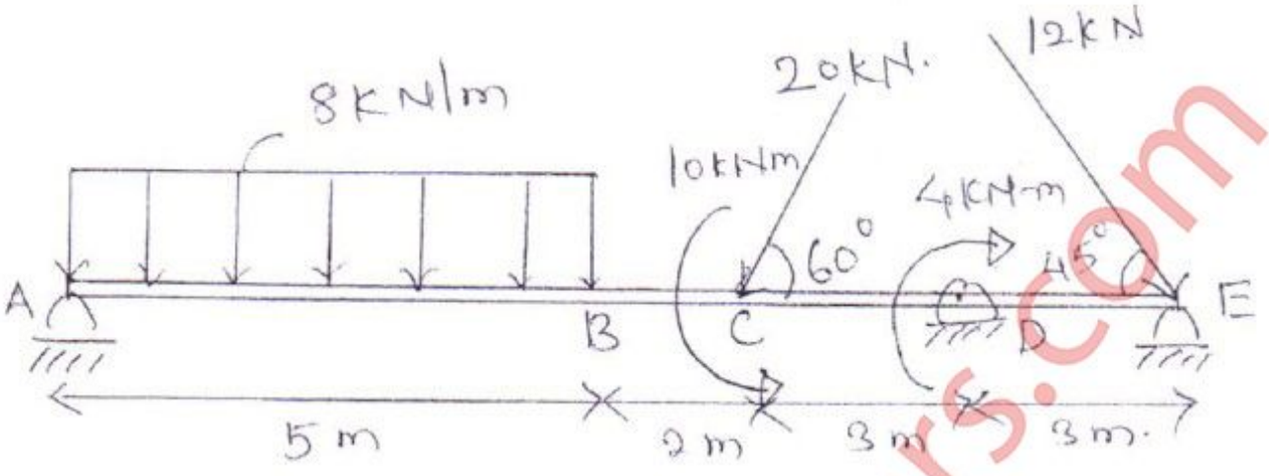
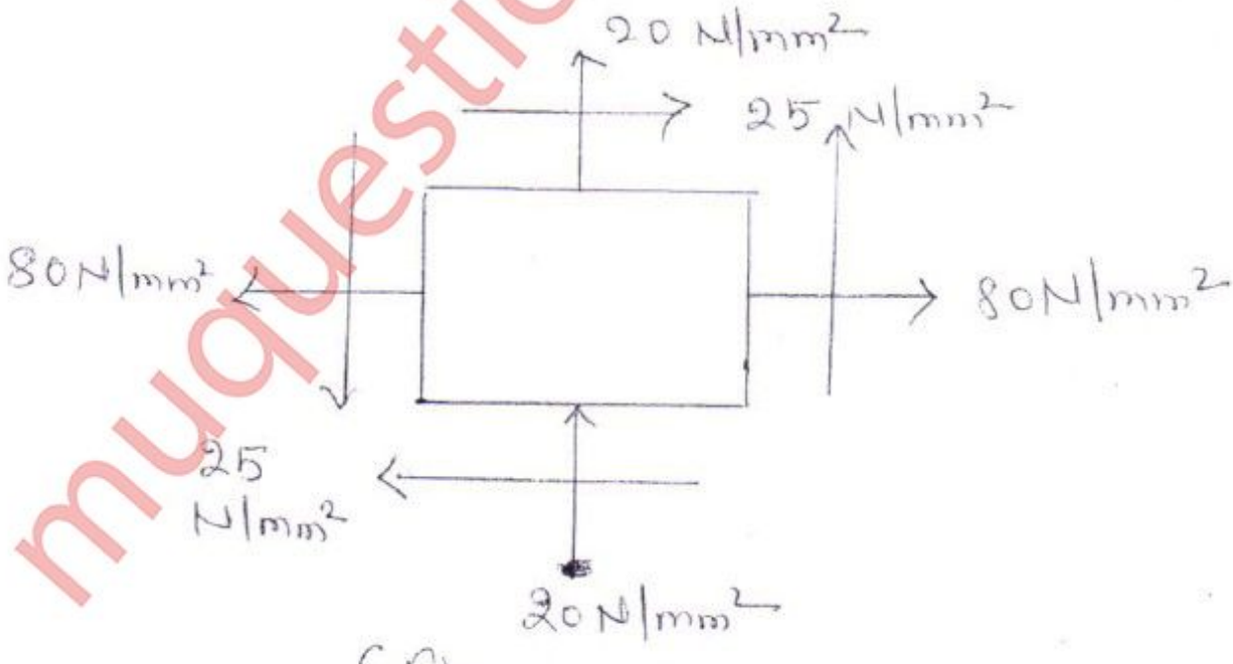


fig 3.b

4. (a) A plane element in the body is subjected to the stresses and shown in fig. 4a. By using graphical method determine the principle stresses and their directions as well as the maximum shearing stresses and the direction of the plane on which they occure. Sketch the stresses on properly oriented planes. **10**



(fig 4.a)

(b) A metalic bar 300 mm × 100 mm × 40 mm is subjected to the force of 5KN(T), 6KN(T) & 4KN(T) along x,y,z directions respectivly. Determine the change in volume of the block. Take E = 2×10^5 N/mm^2 and poissons ratio = 0.25 **10**

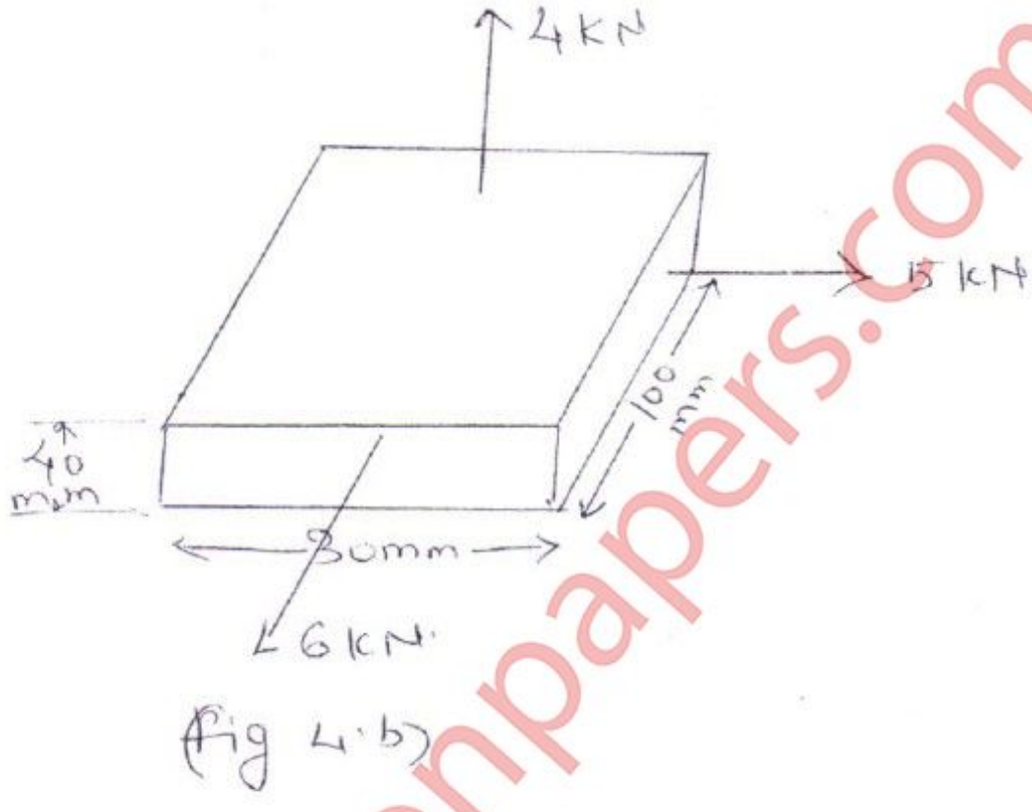


fig 4.b)

5. (a) For the beam supported & loaded as shown in the fig 5a. Find the deflection at point D, slope at A and maximum deflection in 20 KN terms of E. **10**

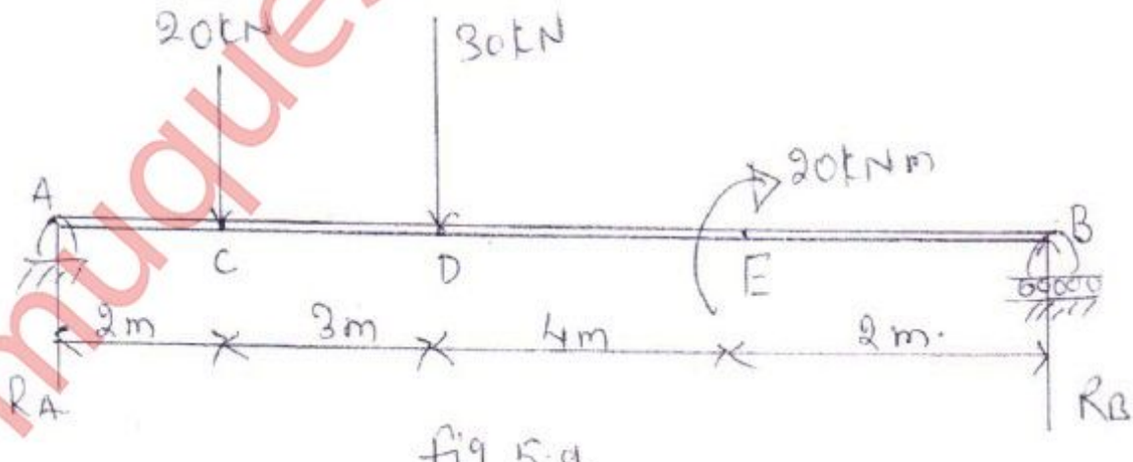


fig 5.a

(b) A hollow shaft having an inside diameter 60% of its outer diameter is to replace a solid shaft transmitting the same power at same speed. Calculate the percentage saving material, if the material to be used is also the same. **10**

6. (a) (i) State and prove the principle of compremental shear stress. **5**

(ii) Derive the expression for the stresses on obligue plane of rectangular body when the body is subjected to simple shear stress. **5**

6. (b) (i) Draw S.F.D. and B.M.D. for the simply supported beam and overhang AB as shown in fig. 6bi. **5**

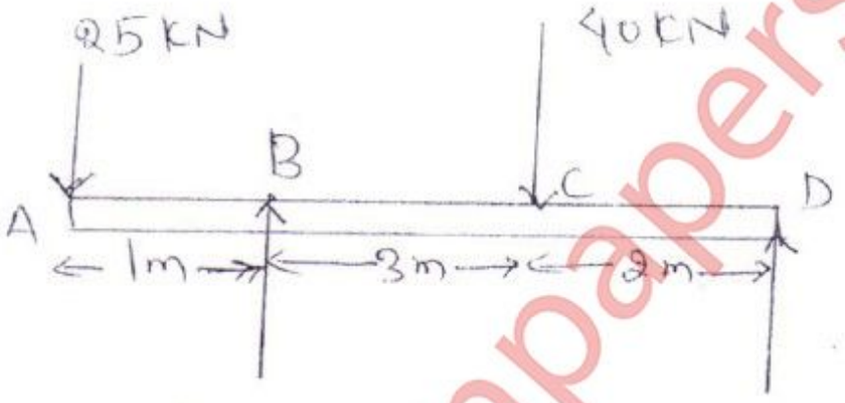


fig 6.b.i

(ii) Write a short note on flitched beams. **5**