SE MECA SEM-IV (CBSGS) Sub- SOM. DT- 15-12-16.

QP Code : 723703

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

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

1. Solve **any four** questions Each question carriers 5 Marks. **20**
   (a) Explain the types of stresses.
   (b) Draw and explain Mohr's Circle for two perpendicular unlike direct stresses.
   (c) Draw S.F.D and B.M.D for the loaded beam as shown in the fig Q.1.C

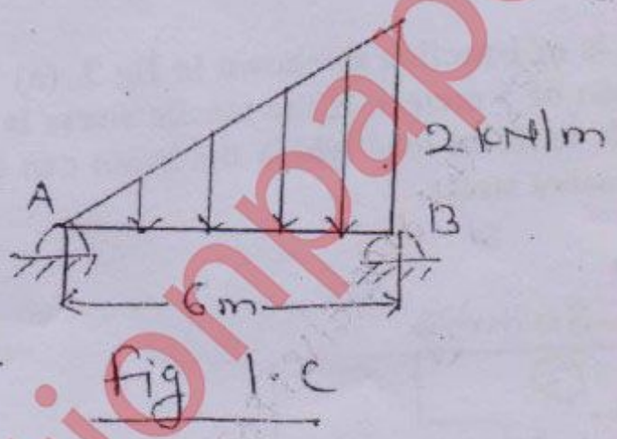

fig 1.C

   (d) Explain the theory of simple bending.
   (e) Explain the use of conjugate beam method over other methods.

2. (a) A solid circular shaft is to transmit 300 KW at 100 rpm. **10**
   (i) If the shear stress is not to exceed 80 mpa, find its diameter.
   (ii) What % saving in weight would be obtained if this shaft is replaced by a hollow one whose internal diameter equals to 0.6 of the external diameter The length, material and maximum shear stress being the same?

   (b) Determine the deflection at B and slope at D for simply supported beam as shown in the fig. 2 (b) Also find the maximum deflection and its location. **10**
   Take $E = 2 \times 10^5$ N/mm^2.
   $I = 300 \times 10^8$ mm^4.

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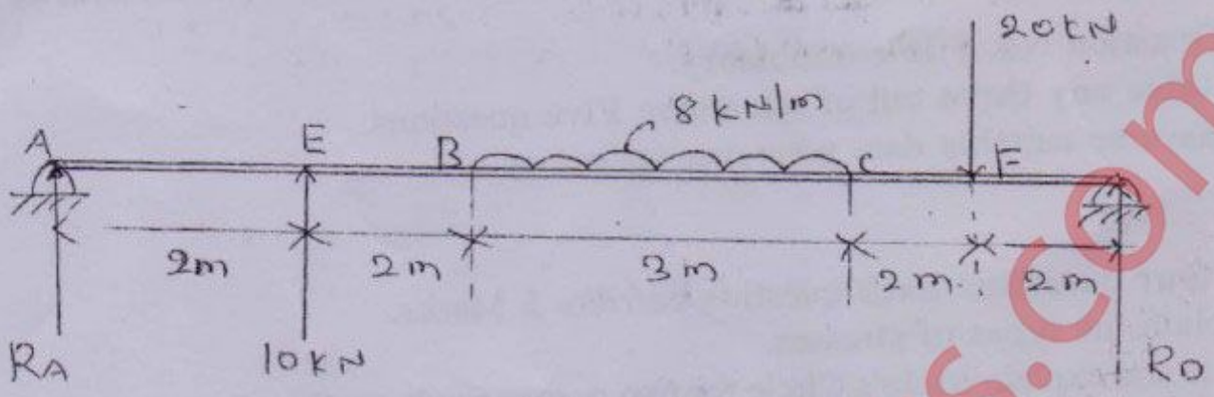


fig 2.b

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

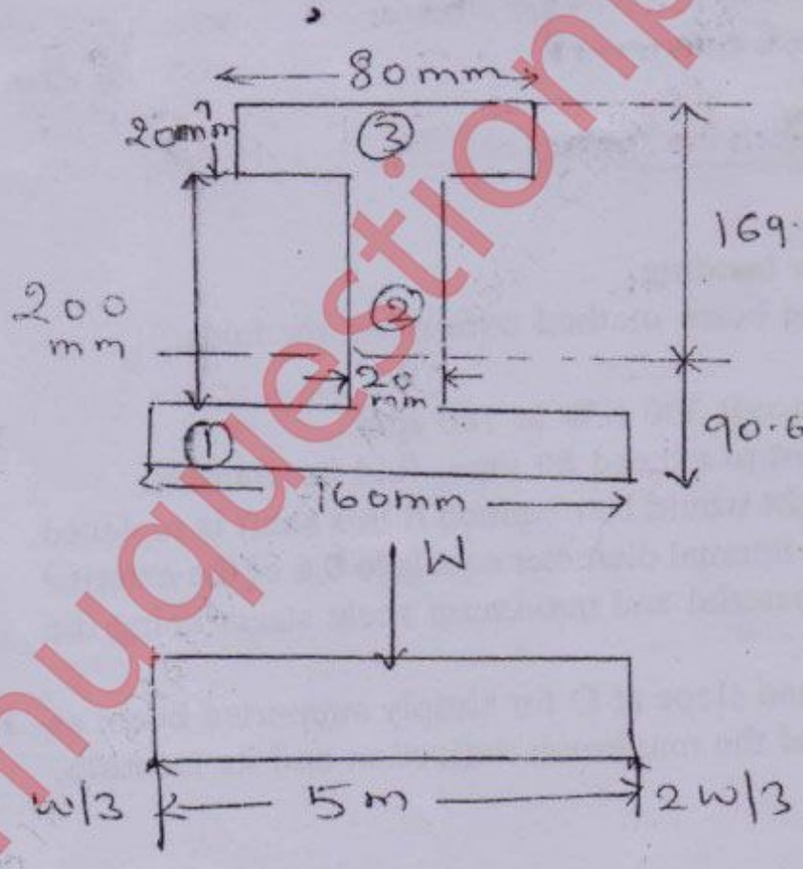


fig 3(a)

(b) Find the load W at C so that reactions at A and B are the same. Hence draw S.F.D and B.M.D for the beam as shown in the fig 3. (b). **10**

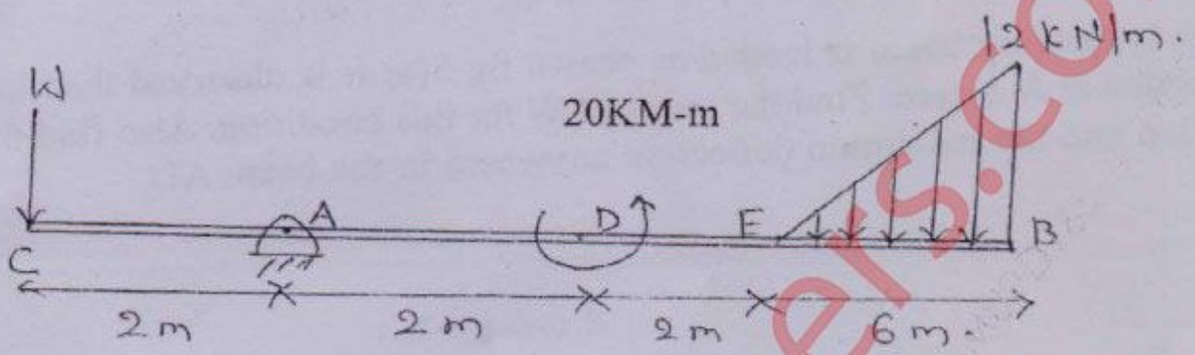
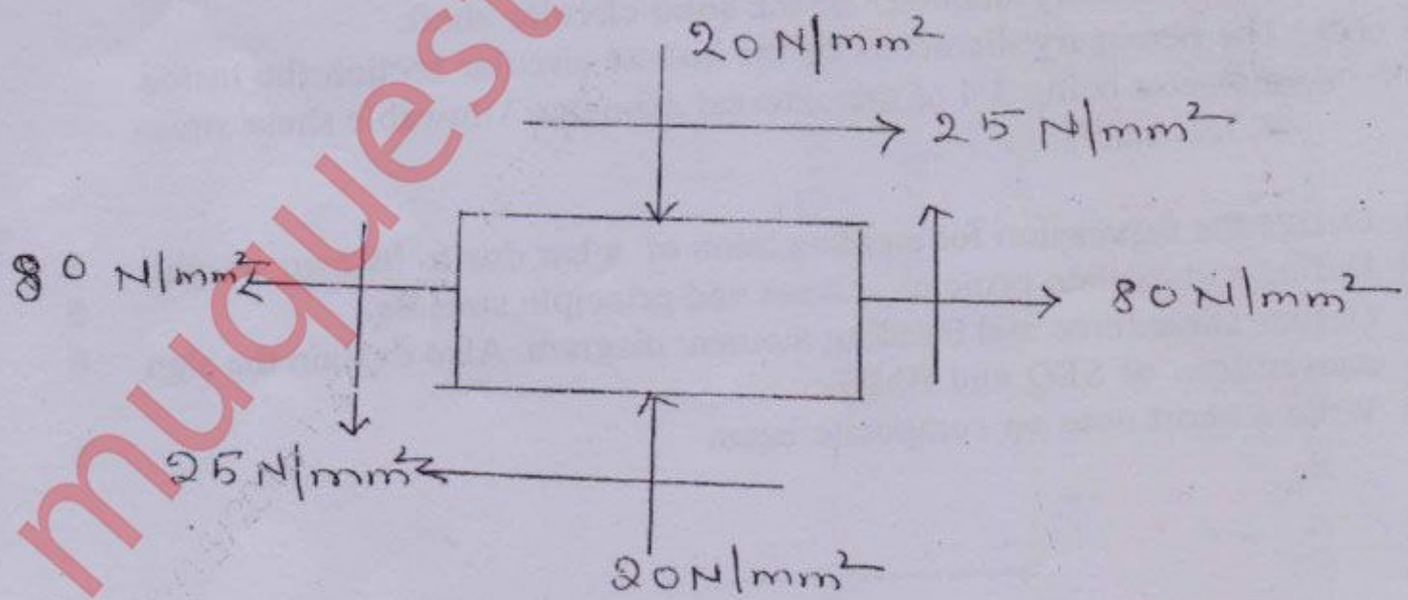


Fig 3.b

4. (a) A plane element in the body is subjected to the stresses as shown in the fig 4.(a) 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 occur. Sketch the stresses on property oriented planes. **10**



(Fig 4.a)

(b) Calculate the modulus of Rigidity and bulk modulus of a cylindrical bar of dia 30mm and of length 1.5m if the longitudinal strain in a bar during a tensile stress is four times the Lateral strain. Find the change in volume when the bar is subjected to a hydrostatic pressure of 100N/mm2. Take $E=1x10^5$ N/mm^2. 10

5. (a) An over hanging beam is loaded as shown fig 5(a) It is observed that the deflection at A is zero. Find the value of W for this condition. Also find the location and the maximum deflection anywhere in the beam AD. 10

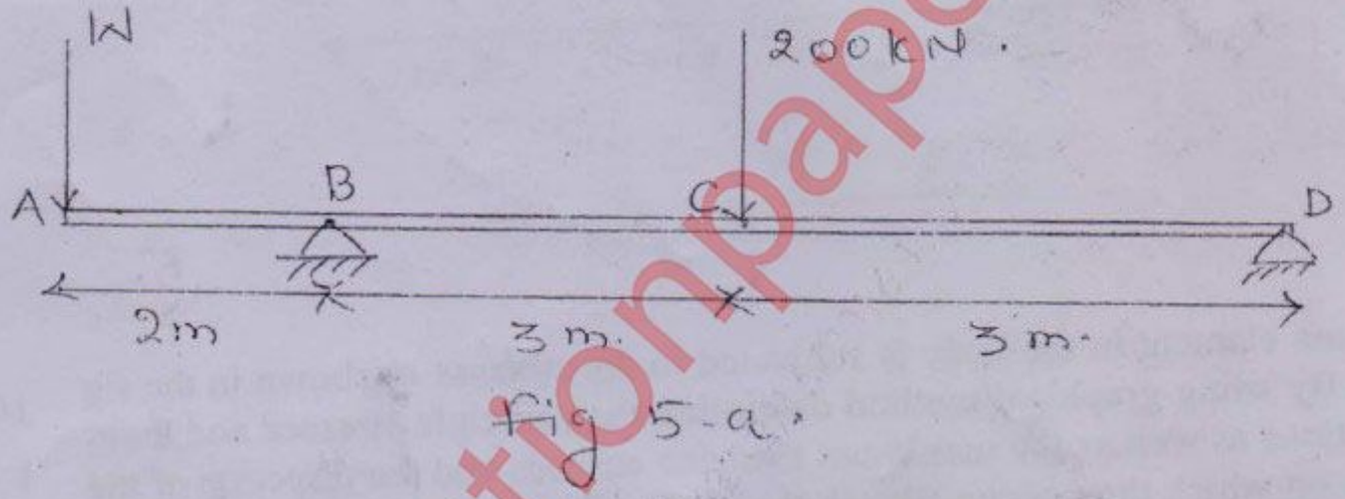


fig 5-a.

(b) 450 kw power has to be transmitted at 100 RPM. Find 10

(i) The necessary diameter of the solid circular shaft.

(ii) The necessary diameters of the hollow circular section the inside diameter being 3/4 of the external diameter Allowable shear stress = $75N/mm^2$.

6. (a) (i) Derive the expression for an elongation of a bar due to its own weight. 5

(ii) Define and explain principle planes and principle stresses. 5

(b) (i) Define shear force and Bending moment diagram. Also explain the sign conventions of SFD and BMD. 5

(ii) Write a short note on composite beam 5
