S.E. (SEM - III) (CBSGS) (MECHANICAL ENGG.) 03rd Dec. 2015
STRENGTH OF MATERIALS 3.00 pm to 6.00 pm

Mechanical/Automobile

Q.P. Code : 5150

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **three** questions frome the remaining **five** questions.
(3) Assume suitable **data** wherever **necesssary**.
(4) **Figures** to the **right** indicate **full** marks.

1. Attempt Any **FIVE**. 20

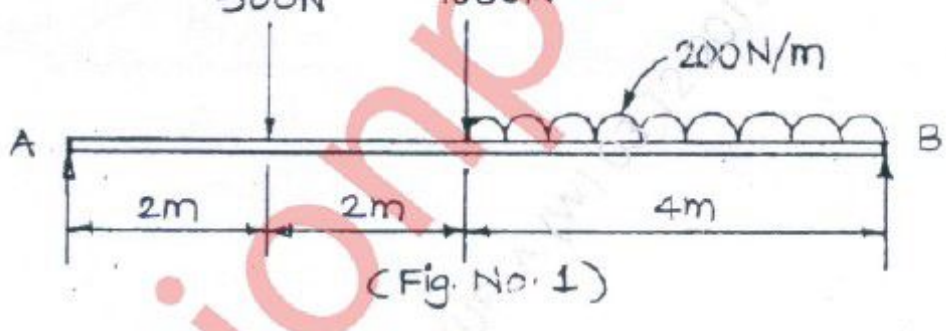
(a) Draw Stress- Strain curve for ductile material & explain salient points on it.

(b) What are the assumptions made in simple bending. Derive flexural formula.

(c) A steel spherical shell of radius 600 mm has a wall thickness of 6 mm. Determine maximum stress caused due to internal pressure of 0.8 N/mm2. Take, E= 210 GPa and Poisson's ratio as 0.3

(d) A hollow circular shaft of 80 mm internal diameter and 150 mm external diameter is subjected to a torque of 70 kN-m. Find maximum shear stress developed.

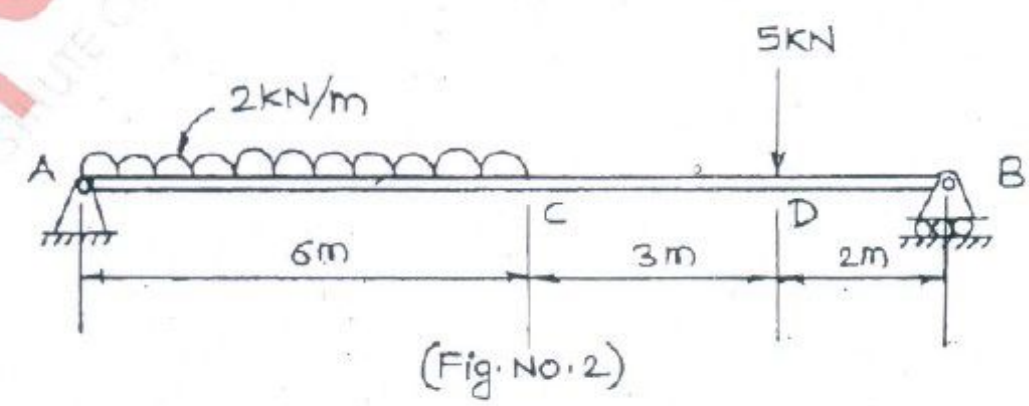
(e) Draw shear force and bending moment diagram for the beam shown in fig. no.1



(Fig. No. 1)

(f) Determine the section of C.I. hollow cylindrical column 6 m long with ends firmly fixed. The ratio of external to internal diameter is 1.3 and carries an axial load of 500 KN. Use factor of safety as 6. Take σ_c=500 N/mm2 and Rankine's Constant, $\alpha = 1/1600$.

2. (a) Find slope at point A & B, deflections at points C & D for a beam as shown in fig. no.2. Also find the maximum deflection. Take, E = 200 GPa & I = 1×10^8mm^4 10



(Fig. No. 2)

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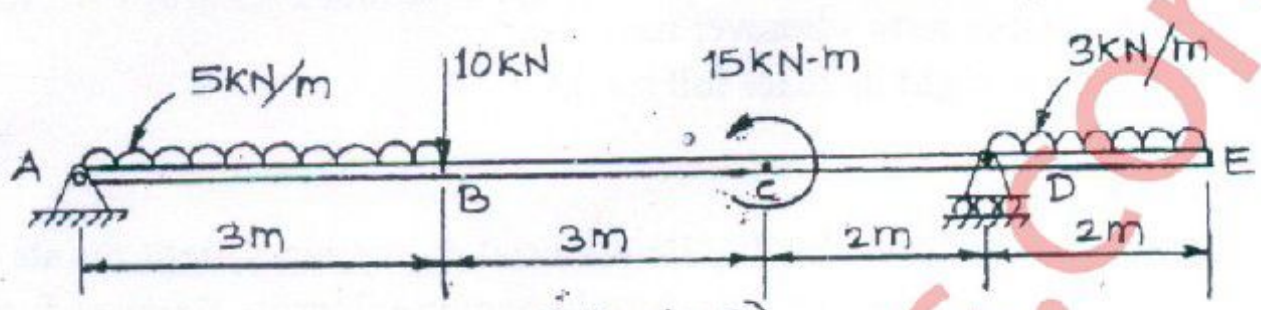
(b) Draw SFD and BMD for the beam shown in fig. no 3. 10



(Fig.No.3)

3. (a) A rectangular block is loaded as shown in fig. no 4. Find the change in dimensions and also change in its volume. 10

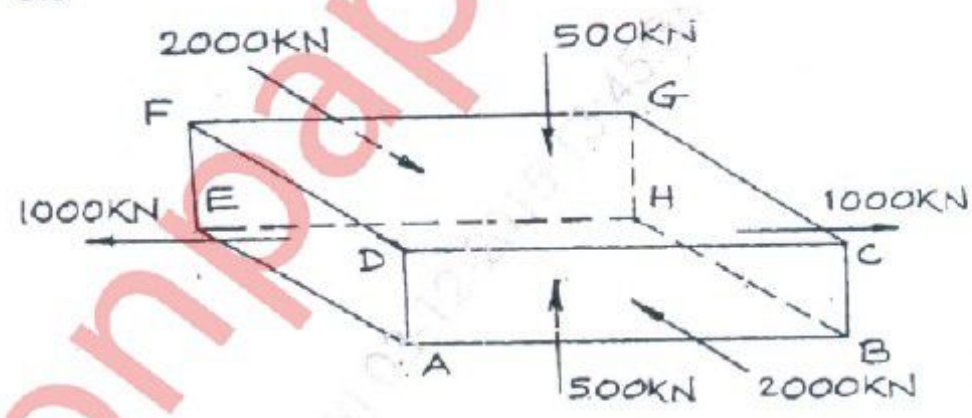
Take, Poisson's Ratio= 0.3

E = 210 GPa

AB =400mm

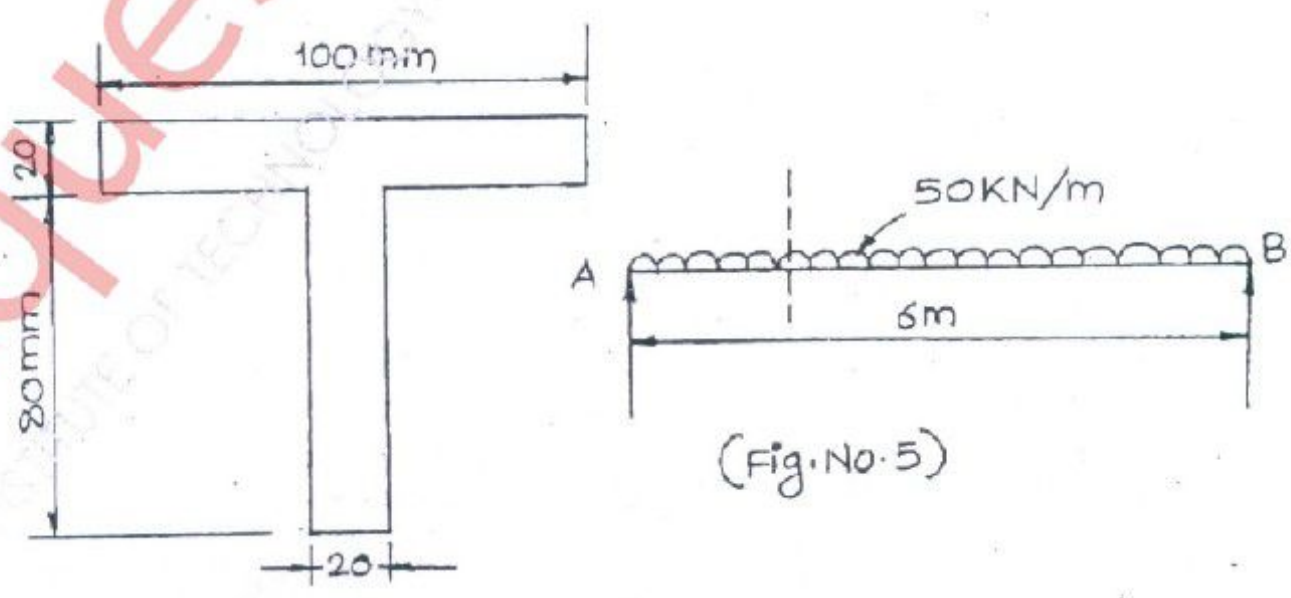
BC= 120mm

AE=250mm



(Fig. No. 4)

(b) A 6m long simply supported beam AB, loaded with u.d.l. of 50 KN/m over entire span as shown in fig. no. 5. Find shear force and bending moment magnitude to be resisted at a section 1.4 m from end A Draw shear force distribution diagram. 10



(Fig.No.5)

4. (a) A 4 m long steel bar of square cross section of 40 mm side is heated through 75° C with its ends clamped before heating. Calculate the thrust exerted by the bar on clamps. 10

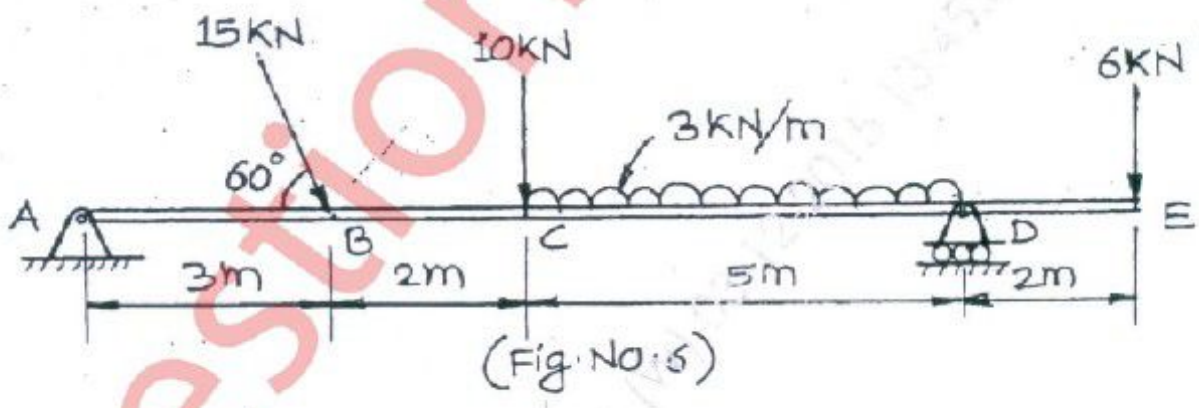
   (i) if the clamps do not yield

   (ii) if the clamps yield by 0.6 mm

   Take, E = 200 GPa & $\alpha = 11.5 \times 10^{-6}$ /° C

   (b) A shaft is used to transmit 40 KW at 200 r.p.m. Calculate the diameter ofshaft if the angle of twist is not to exceed 1^0 in a length of 25 times the diameter of shaft and maximum permissible shear stress is not to exceed 100 N/mm². Take, G = 84 GPa. If the shaft is replaced by hollow shaft with the ratio of diameters as 0.6, find inside and outside diameter of the shaft. 10

5. (a) Draw SFD & BMD for the beam shown in fig. no. 6. 8

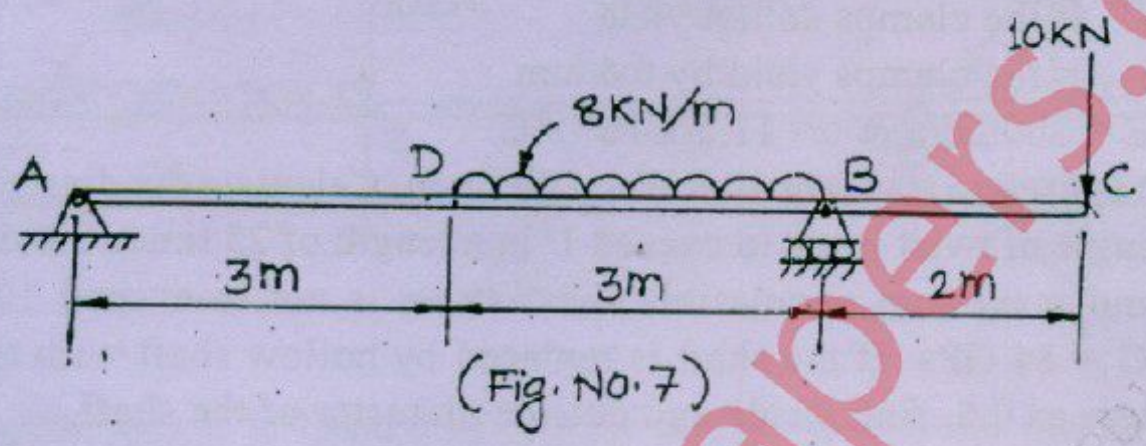


(Fig No:6)

   (b) Determine instantaneous stress and deformation of a rod of length 1.2 m and the diameter 8 mm, if a mass of 90 kg falls through a height of 15 em and strikes the bottom of the rod. The rod is freely suspended and fixed at the top. Take, E = 210 GPa. 8

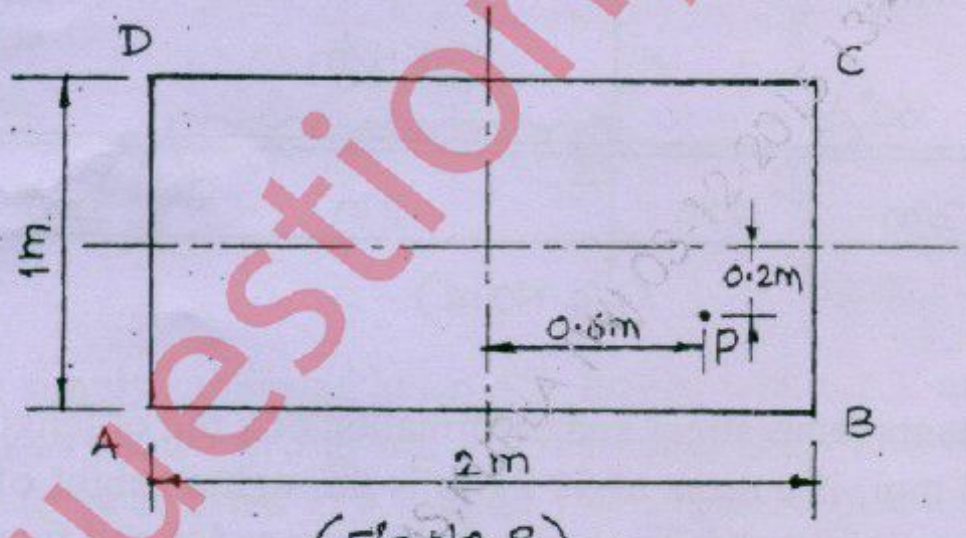
   (c) What is the minimum actual length of the column for which Eular's formula hold good, if the cross section of uniform column is a square of side 150 mm. The column has one end hinged and the other end fixed. Take, σ_c=250 N/mm2 and E=200 GPa. 4

6. (a) Determine deflection at the free end 'C' for the beam shown in fig. no 7. Take, E = 200 GPa and I= 15 x 10^{-6} m^4. 8



(Fig. No. 7)

(b) A vertical column of rectangular section is subjected to a compressive load of P=800 KN as shown in fig. no. 8. Find the stress intensities at the four comers of the column. 8



(Fig No. 8)

(c) A steel rod 5m long and 20 mm in diameter is subjected to an axial tensile force of 1000 KN. Find the changes in length, diameter and volume of the rod. Take, E = 210 GPa and poisson's ratio of 0.3 4
