Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5352]-119

S.E. (Mechanical/Mechanical-SW/Automobile)

EXAMINATION, 2018

STRENGTH OF MATERIALS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) *All* the four question should be solved in one answer-book and attach the extra supplements if required.

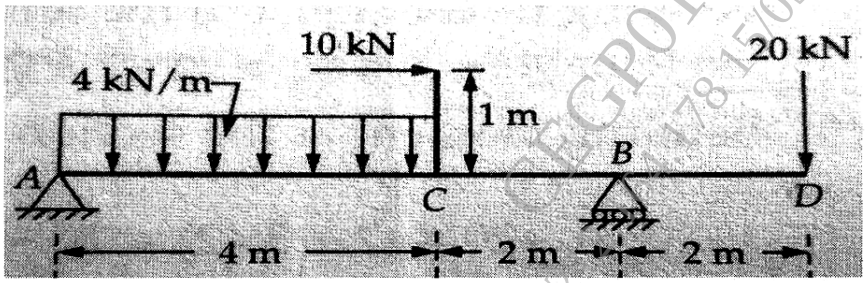
(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

Q.1 A) A bar of cross section 8 mm X 8 mm is subjected to an axial pull of 7000 N. The lateral dimension of the bar is found to be changed to 7.9985 mm X 7.9985 mm. If the modulus of rigidity of the material is 0.8 X 10^5 N/mm^2, determine the Poisson's ratio and modulus of elasticity. **[06]**

B) Draw SFD and BMD for the beam shown in following figure. Also locate the points of contra flexure if any. **[06]**



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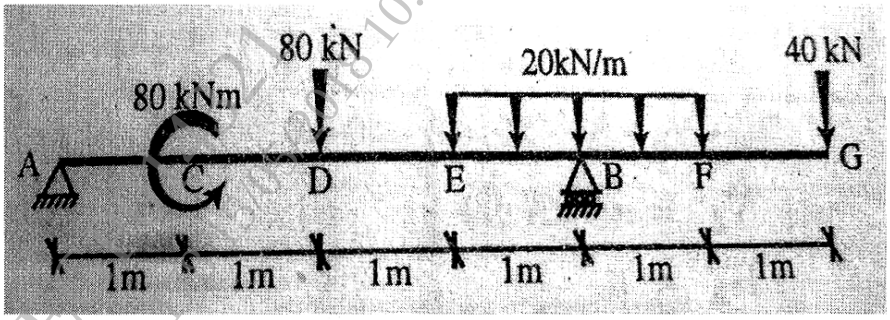
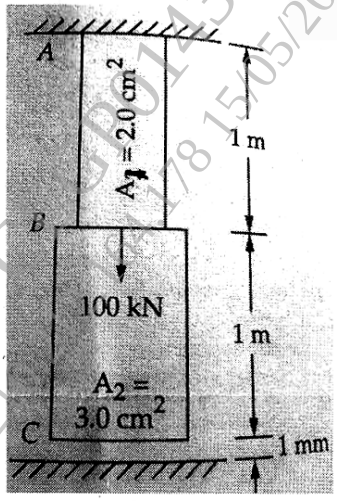
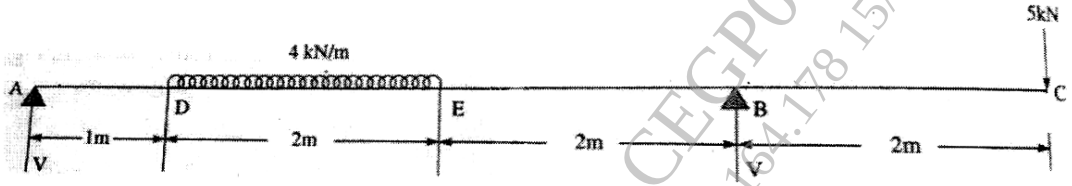
Q.2 A) The beam is supported and loaded as shown in figure. Draw SFD and BMD indicating all important values. **[06]**



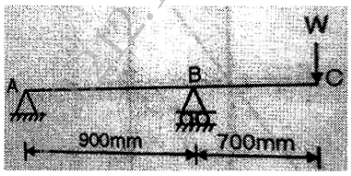
B) A bar ABC shown in figure consist of two parts, AB and BC, each part being 1 m long and having cross sectional areas 2 cm^2 and 3 cm^2 respectively. The bar is suspended from A and there is a rigid horizontal support at 2.001 m from A. A force of 100 kN acting vertically downwards is applied at B. Determine the stresses in parts AB and BC of the bar. Take E = 200 GN/m^2. **[06]**

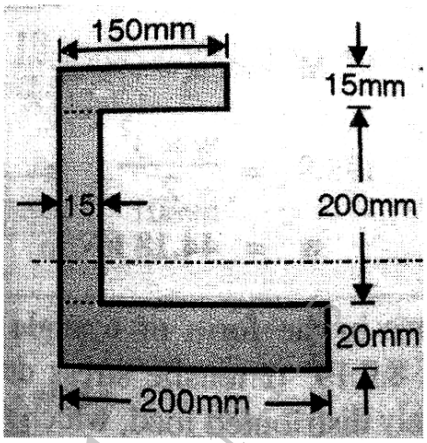


Q.3 A) For the loaded beam shown in figure. Find the deflection at free end and the maximum deflection between the supports. Take E = 200 kN/mm^2 and I = 9 X 10^6 mm^4. **[06]**



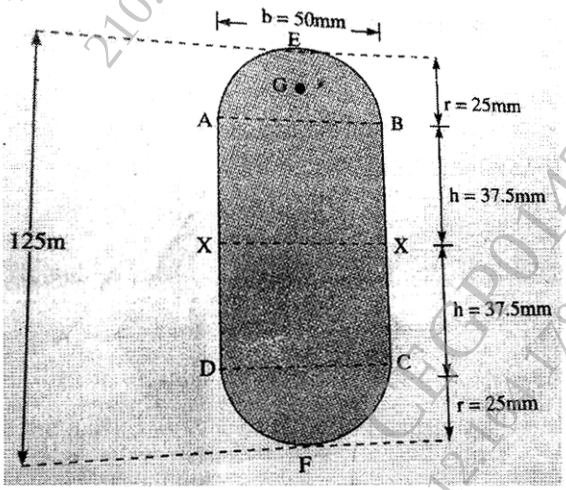
B) A simply supported overhang is loaded with point load as shown in figure. A CI beam of C section with top flange 150 mm X 15 mm, bottom flange 200 mm X 20 mm and web 15 mm X 200 mm. The allowable stresses in tension and compression are 120 Mpa and 90 Mpa. Find the safe value of load 'W' on the overhang. **[06]**





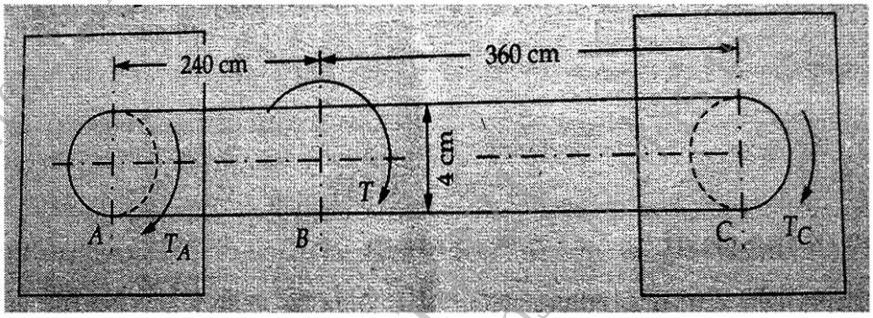
Q.4 A) A crane chain whose cross sectional area is 6.25 cm^2 carries a load 10 kN which is being lowered at uniform rate of 40 m/minute when the length of the chain unwound is 10 m the chain jams suddenly on the pulley. Estimate the stress induced in the chain due to sudden stoppage. Neglect the weight of chain. Take E = 210 GPa. **[06]**

B) The section of a steel bar 50 mm X 125 mm rounded by semicircles as shown in figure. Find the maximum shearing stress produced due to a vertical shear force of 250 kN. **[06]**

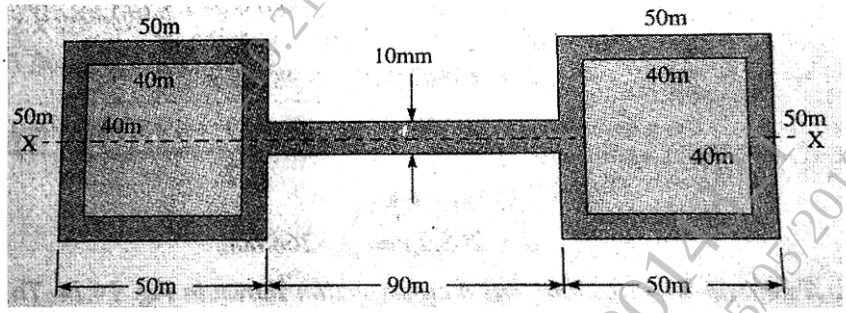


Q.5 A) Determine the ratio of the buckling strengths of a solid steel column to that of a hollow column of same material and having same cross sectional area. The internal diameter of hollow column is half of its external diameter. Both the columns are of the same length and are pinned at both ends. **[07]**

B) A 600 cm long solid shaft is fixed at both ends. A torque of 75 kN cm is applied to the shaft at a section of 240 cm from one end. What are the fixing torques set up at the ends of the shaft? If the diameter of the shaft is 4 cm, calculate the maximum stress developed in the two portions. Also find the angle of twist at the point where the torque is applied. Take G = 75 kN/cm^2. **[06]**



Q.6 A) Figure shows the cross section of a member of a machine. If the member is 1.25 m long with both the ends fixed. Calculate the safe axial thrust the member can resist. Take σ_c = 320 N/mm^2 **[07]**



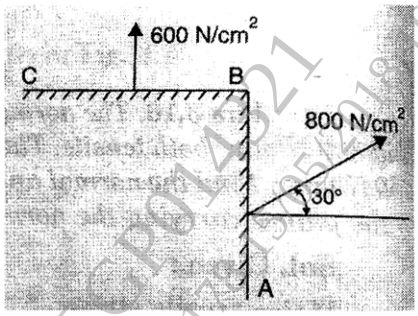
B) A hollow shaft of diameter ratio 3/5 is required to transmit 482 KW at 125 rpm. The shearing stress in the shaft must not to exceed 65 N/mm^2 and the twist in a length of 2 m not to exceed 1 degree. Calculate minimum external diameter of shaft which would satisfy these conditions. Take G= 8 X 10^4 N/mm^2. **[06]**

Q.7 A) A solid circular shaft is subjected to a bending moment of 8 kNm and a torque of 12 kNm. In a uniaxial test the shaft material gave the following results: Modulus of elasticity = 200 GN/m^2, Stress at yield point = 300 N/mm^2, Poisson's ratio = 0.3, Factor of safety = 3. Estimate the least diameter of the shaft using **[06]**

i) Maximum principal stress theory

ii) Maximum principal strain theory

B) The intensity of resultant stress on a plane AB as shown in figure at a point in a material under stress is 800 N/cm^2 and it is inclined at 30^0 to the normal to that plane. The normal component of stress on another plane BC at right angles to plane AB is 600 N/cm^2. Determine: i) the resultant stress on the plane BC, ii) the principal stresses and their directions and iii) the maximum shear stress. **[07]**



Q.8 A hollow circular shaft whose outside diameter is 3 m and whose inside diameter is equal to one half the outside diameter. The shaft subject to a twisting moment of 20,000 N-m as well as a bending moment of 30,000 N-m. Detremine the principal stresses in the body. Also determine the maximum shearing stress. **[13]**