S.E.(PRODUCTION ENGG)(SEM III) (CBSGS) (REV-2012) / T1488 - STRENGTH OF MATERIAL 107.12.17

Q.P. Code: 25989

(Hours: 03) **Marks: 80**

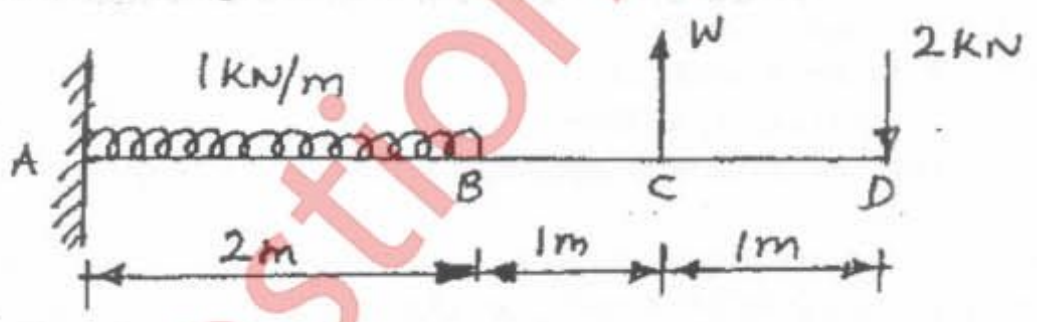
N.B. : 1. Question No **1** is **compulsory**
2. Attempt any **Three** questions from the remaining five questions.
3. Assume any **suitable data** if necessary with justification.
4. Figures to the right indicates full marks

Q.1 Attempt any **four** of the following questions. **20**

a) Draw SFD and BMD for a cantilever beam of span L, carrying audl whose intensity is w per unit run over its entire span.
b) Prove that for a beam of rectangular section maximum shear stress is 1.5 times the average shear stress.
c) Derive the Differential equation of the Elastic Curve.
d) Prove that for a beam of rectangular section maximum shear stress is 1.5 times the average shear stress.
e) A steel column is 120 mm in diameter and 3 m long. Find the intensity of stress and the strain when it carries an axial compressive load of 950 KN. Take $E_s = 2 \times 10^5$ N/mm^2.

Q.2 a) A steel bar 50mm diameter and 640mm long has an axial hole 30mm diameter drilled from end and along the point of its length. The length of the hole is such that the extension of hollow part of bar is equal to extension of solid part of the part, when it is axially loaded by tensile forces at the ends. Calculate the length of the hole. Take E=210 GN/m^2. **10**

b) For the beam loaded as shown in figure, find the value of W such that BM at support is zero. Also draw SF and BM diagram. **10**



Q. 3 a) A cantilever beam of span 2m has inverted T cross section. The flange at bottom is 150mm wide and 12mm thick, the web is 12mm thick and the overall depth of the section is 150mm. If the permissible tensile stress is 125MPa, find the maximum intensity of udl that may be applied all over the span. Also calculate the force resisted by the flange. **10**

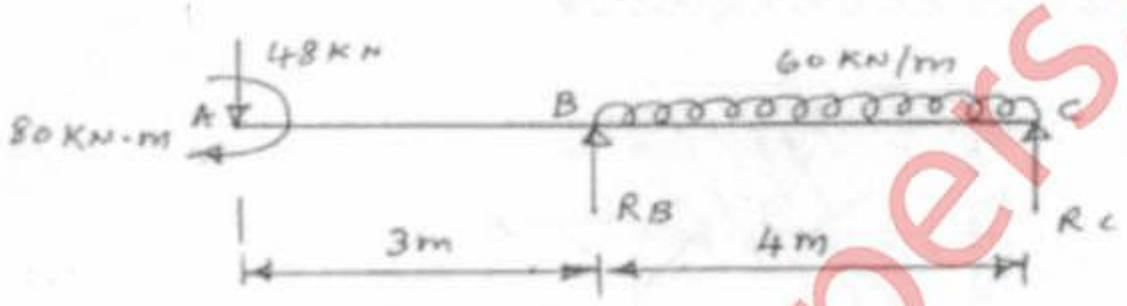
b) A cast iron bracket subjected to bending has a c/s of I shape with unequal flanges. Top flange 240mm x 40mm, bottom flange 120mm x 40mm and web 240mm x 40mm. if the section is subjected to shear force of 120kN, draw shear stress distribution diagram over the depth of the section. **10**

Q.4 a) Evaluate the power that can be transmitted at 300rpm by a hollow steel shaft of 75mm external and 50mm internal diameter when permissible shear stress for the steel is 70 MN/ mm^2 and maximum torque is 1.3 times the mean? Compare the strength of this hollow shaft with that of solid shaft of same material and length. **10**

b) Write the assumptions in simple bending and hence derive flexural equation **10**

$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ with usual notations.

Q.5 a) A simply supported beam is subjected to the loads as shown in the figure. Determine the maximum deflection induced in the beam. Take value of EI = 1·2 x 10^5 N-m^2. **10**



b) A hollow cast iron column whose outside diameter is 200 mm has a thickness of 20 mm. It is 4.5 m long and fixed at both ends. Calculate the safe load of Rankine formula using a factor of safety 4.Calculate the slenderness ratio and ratio of Euler's critical load to Rankine's critical load.

Take E=8x10^4 N/mm2, σc=550 N/mm^2 and α=1/1600 in Rankine's formula. **10**

Q.6 a) At a point in a strained material the stresses on the two mutually perpendicular planes are 80 MPa tensile and 50 MPa compressive, accompanied by shear stress of 30 MPa. Find the normal, tangential and resultant stress intensities on a plane at 60° to the plane carrying the tensile stress. Also determine the principal stresses value of maximum shear stress and their orientations. **10**

b) An unknown weight falls by 22 mm on to a collar rigidly connected to the lower end of the vertical bar 3 m long and 500 mm^2in sections. If the maximum instantaneous extension is known to be 2.5 mm, find the corresponding stress and the magnitude of the falling weight. Take E = 2 x 10^5 N/mm^2. **10**
