**(OLD COURSE)**

QP Code :12268

Time: 3Hrs

Max. Marks: 100

Note: (1) Question No 1 is compulsory. Answar any four from remaining questions
(2) Illustrate answers with neat sketches whereever required
(3) Assume suitable datewherever required

1. Answer any four of the following (4 x 5 = 20)

   (a) Define Poissions ratio, Bulk modulus. Write the relation between the elastic constants.

   (b) Derive the Flexure formula $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$

   (c) Draw the S F and B M diagram for the beam shown in the Fig
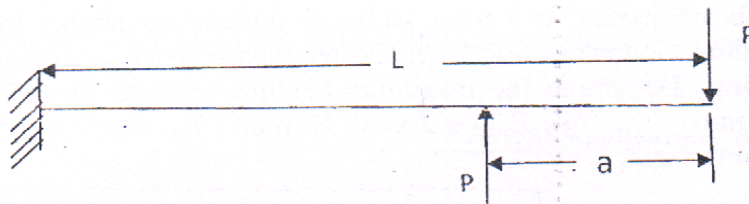
   (d) For a rectangular beam of depth d, maximum shear stress at the neutral axis is 10MPa. Find the shear stress at a layer situated at d/4 from the neutral axis.

   (e) A short coloum of external diameter 400 mm and internal diameter 200mm carries an eccentric load of 80 KN, find the greatest eccentricity, which the load can have without producing tension on the cross section.

   (f) Find expression for the total elongation of a bar due to its own weight, when the bar is fixed as its upper end and hanging freely at the lower end.

2. (a) A compound bar consists of a copper rod 20mm in diameter and a steel tube 60mm in external diameter, with thickness 5mm. The copper rod and steel tube are assembled co-axially and their ends are rigidly fixed ar 30^0C . If the compound is heated to 130^0C, determine the stress induced in each metal. Take E_s=200KN/mm^2 ; E_{cu}=120KN/mm^2; α_s = 12 x 10^{-6} / °C and α = 18 x10^{-6} / °C **(10)**

   (b) An unknown weight falls through 8mm on a collar rigidly attached to the lower end of a vertical bar, 4m long and 40mm x 20mm section. If the max instantaneous extention is known to be 3mm, what is the corresponding stress and the vallue of the unkonwn weight? Take E = 2 x 10^5 N/ mm^2 **(10)**

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