B. TECH. SEM - III (PRODUCTION ENGG.) (2014 COURSE)
(CBCS) : SUMMER - 2018

SUBJECT: STRENGTH OF MACHINE ELEMENTS

Day: Thursday **Date:** 24/05/2018 **S-2018-2262** **Time:** 02.30 PM TO 05.30 PM **Max. Marks: 60**

N.B:

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Assume suitable data if **NECESSARY.**

Q.1 A bar of 20 mm diameter is tested in tension. It is observed that when a load of 37.7 kN is applied, the extension measured over a gauge length of 200 mm is 0.12 mm and contraction in diameter is 0.0036 mm. Find Poisson's ratio and elastic constants E, G and K. **(10)**

OR

Q.1 A load to be carried by a lift may be dropped 100 mm on the floor. The cage itself weighs 100 kg and is supported by 25 m of wire rope weighing 0.9 kg/m. The rope consists of 49 wire each of 1.6 mm diameter. The maximum stress in the wire is limited to 90 N/mm^2 and $E = 70 \times 10^3$ N/mm^2. Find the maximum load which can be carried. **(10)**

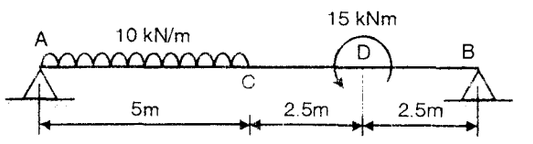
Q.2 At a point in a strained material there is tensile stress of 80 N/mm^2 upon a horizontal plane and a compressive stress of 40 N/mm^2 upon a vertical plane. There is also a shear stress of 48 N/mm^2 upon each of these planes. Determine the planes of maximum shear stress at the point. Determine also the resultant stress on the planes of maximum shear stress. **(10)**

OR

Q.2 The stresses at a point in a body are $\sigma_x = 95$ MPa, $\sigma_y = 20$ MPa and $\tau_{xy} = 80$ MPa. Material has yield point stress of 300 MPa. Find the factor of safety by: **(10)**

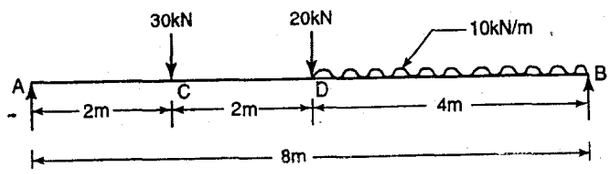
i) Maximum shear stress theory
ii) Mises Hencky theory

Q.3 Draw shear force and bending moment diagram for the beam shown in Fig. **(10)**



OR

Q.3 The simply supported beam shown in Fig. carries two concentrated loads and uniformly distributed load. Draw the SFD and the BMD. **(10)**



P.T.O.

Q.4 Find the diameter of the shaft required to transmit 60 kW at 150 r.p.m. if the maximum torque is likely to exceed the mean torque by 25% for maximum permissible shear stress of 60 N/mm^2. Find also the angle of twist for a length of 2.5 meters. **(10)**
Take C = 8 x 10^4 N/mm^2.

OR

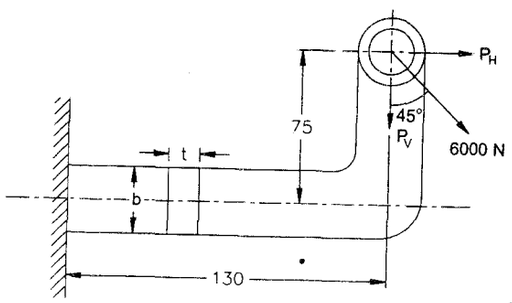
Q.4 A beam of length 5 m of uniform rectangular section is supported at its ends and carries uniformly distributed load over the entire length. Calculate the depth of the section if the maximum permissible bending stress is 8 N/mm^2 and central deflection is not to exceed 10 mm. **(10)**
Take the value of E = 1.2 x 10^4 N/mm^2.

Q.5 A beam of T-section, 4 m long carries a uniformly distributed load 'w' per meter run throughout its length. The beam is simply supported at its ends. The T-section is 20 x 10 x 1.2 cm i.e web is 18.8 x 1.2 cm and flange is 10 x 1.2 cm. What is the maximum value of 'w' so that the stress in the section does not exceed 60 MPa? **(10)**

OR

Q.5 A simply supported wooden beam of span 1.3 m having a cross section 150 mm wide by 250 mm deep carries a point load 'w' at a centre. The permissible stresses are 7 N/mm^2 in bending and 1 N/mm^2 in shearing. Calculate the safe load 'w'. **(10)**

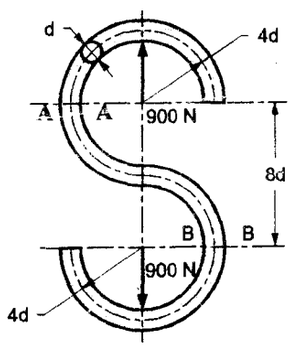
Q.6 A mild steel bracket shown in fig. is subjected to a pull of 6000 N acting at 45^0 to the horizontal axis. The bracket has a rectangular section whose depth is twice the thickness. Find the cross sectional dimensions of the bracket, if the permissible stress in the material of the bracket is limited to 60 MPa. **(10)**



All dimensions in mm

OR

Q.6 An open 'S' link made of plain carbon steel 55C8 (σ_{yt} = 399 N/mm^2) is shown in Fig. Calculate the dimensions of the link, if the factor of safety is 6. **(10)**



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