B. Tech. Sem - III (Production Engg.) (2014 COURSE) (CBCS) :
WINTER - 2018
SUBJECT: STRENGTH OF MACHINE ELEMENTS

Day: Friday
Date: 30/11/2018

Time: 10.00 AM TO 01.00 PM
Max Marks. 60

W-2018-2318

N.B. :

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data if necessary.

Q.1 A small light piston 125 mm^2 in area compresses oil in rigid container of 15 litres capacity. When a weight of 45 N is gradually applied to the piston its movement of 45 N is gradually applied to piston its movement is observed to be 15mm. Find the bulk modulus of the oil. If a weight of 18 N falls from a height of 72mm on to the 45 N load, determine the maximum pressure developed in the oil container, neglecting the effect of friction and a loss of energy at the impact. **(10)**

OR

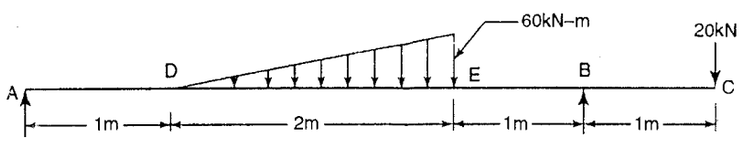
Q.1 Find the elongation in mm of a straight bar steel 12 meters long due to its own weight if hung. The value of the modulus of elasticity of the material is unknown. However, it is known that the modulus of the rigidity of the material is 0.88×10^5 M/mm^2 and poisson's ratio is 0.25. Take specific weight of steel equal to 8.3×10^{-5} N/mm^3. **(10)**

Q.2 Two direct stresses are acting at two mutually perpendicular planes in a material. Both of them are tensile and are 150 N/mm^2 and 80 N/mm^2 respectively. Find the shear stress acting on the planes to consider the materials failure according to maximum principal stress theory, maximum shear stress theory and shear strain energy theory. Take yield stress to be equal to 300 N/mm^2. **(10)**

OR

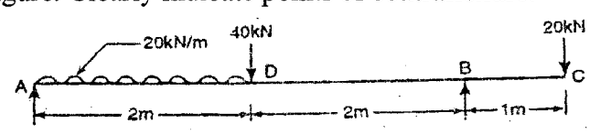
Q.2 A short metallic column of 500 mm^2 cross-sectional area carries an axial compressive load of 100kN. For a plane inclined at 60^0 with the direction, calculate: **i)** Normal stress **ii)** Tangential stress **iii)** Resultant stress **iv)** Maximum shear stress **v)** Obliquity of resultant stress. **(10)**

Q.3 Draw the BMD and SFD for the overhanging beam shown in Figure. Indicate all significant values including point of contraflexure. **(10)**



OR

Q.3 Draw bending moment and shear force diagram for the overhanging beam shown in figure. Clearly indicate points of contraflexure. **(10)**



P.T.O.

Q.4 A hallow shaft with diameter ratio 3/5 is required to transmit 450 kw at 120 rpm. with uniform twisting moment. The shearing stress in the shaft must not exceed 60 N/mm^2 and the twist in a length of 2.5 m must not exceed 1^0. Calculate the minimum external diameter of the shaft satisfying these conditions. **(10)**
Take the modulus of rigidity $C = 8 \times 10^4$ N/mm^2.

OR

Q.4 A 2m simple beam having cross section 150mm × 500mm carries a point load of 20kN at a distance of 0.5m from the left end. Find the slope at the two ends, deflection under the load and the maximum deflection. **(10)**
Take $E = 2 \times 10^4$ N/mm^2.

Q.5 A beam of I section with following properties: base = 60mm, depth = 200mm, Ixx = 780.7 cm^4 Iyy = 17.3cm^4 I section is used as cantilever of 5 meters length. How much load can be applied at the free end of cantilever so that stress in section does not exceed 100 MPa. **(10)**

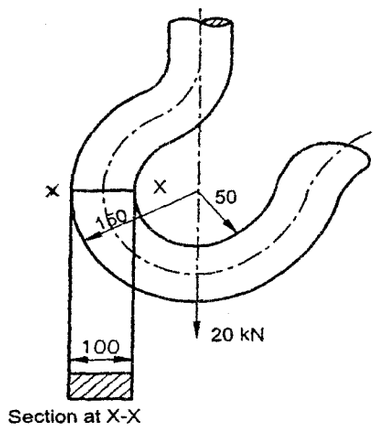
OR

Q.5 A simple supported T beam has a span of 2m. The flange is 125 mm × 25mm and web is 175mm × 20mm. the beam carries a UDL of 15 kN/m throughout. Calculate the bending stress and shear stress value for maximum value of BM and SF. Draw neat sketches showing bending stress and shear stress distribution diagram across the section. **(10)**

Q.6 A closed ring of mean radius of curvature 90mm is subjected to a pull of 3kN. The line of action of the load passes through the centre of the ring. Calculate the maximum tensile and compressive stresses in the material of the ring if the ring is circular in cross-section with diameter equal to 15 mm. **(10)**

OR

Q.6 The crane hook carries a load of 20kN. As shown in figure. The section at X-X is rectangular whose horizontal side is 100mm. Find the stress in inner and out fibres at the given section. **(10)**



Section at X-X

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