B. Tech. Sem - III (Production Engg.) (2014 COURSE) (CBCS) :
SUMMER - 2019

SUBJECT: STRENGTH OF MACHINE ELEMENTS

Day: Tuesday
Date: 14/05/2019

S-2019-2583

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) Assume suitable data if necessary.

Q.1 A chain link is made of 20mm diameter round steel with mean radius of circular ends 25 mm, the length of straight portion being 20mm. Determine the value of maximum tensile and compressive stress. When the link is subjected to a pull of 20kN at its ends. **(10)**

OR

Q.1 A solid vertical prismatic steel bar of equilateral triangular section of side 25 mm is firmly fixed at top. A rigid collar is attached at the lower end at a distance of 600 mm from top. Compute the strain energy in each of the following cases: **(10)**

i) When a pull of 10kN is applied gradually.
ii) When a force of 8kN is suddenly applied.
iii) When a weight of 4kN falls through 120mm. Assume E = 210GPa.

Q.2 A solid circular shaft is subjected to a bending moment of 40kN-m and a torque of 10kN-m. Design a diameter of shaft according to: **(10)**

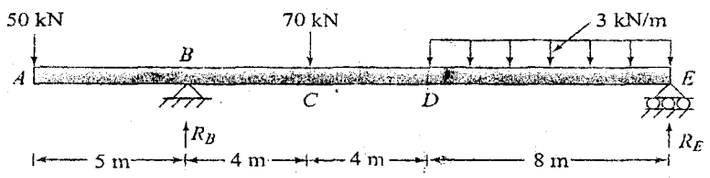
i) Maximum principle stress theory
ii) Maximum shear stress theory
iii) Maximum strain energy theory

Take $\mu = 0.25$, stress at elastic limit = $200N/mm^2$ and factor of safety = 2.

OR

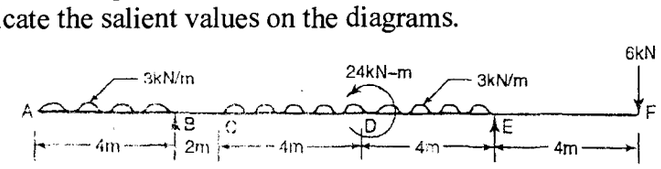
Q.2 A thin cylindrical tube 80mm internal diameter and 5mm thick, is closed at the ends and is subjected to an internal pressure of $6MN/m^2$. A torque of 2009.6 Nm is also applied to the tube. Find the hoop stress, longitudinal stress; maximum and minimum principal stresses and maximum shear stress. **(10)**

Q.3 Draw the shear force and bending moment diagrams for the beam as shown if figure. **(10)**



OR

Q.3 Draw the bending moment and shear force diagrams for the beam shown in fig. indicate the salient values on the diagrams. **(10)**



P.T.O.

Q.4 Determine the diameter of solid shaft which will transmit 300kw at 250 rpm. The maximum shear stress should not exceed $30N/mm^2$ and twist should not be more than 1^0 in a shaft length of 2m. Take modulus of rigidity = 1×10^5 N/mm^2. **(10)**

OR

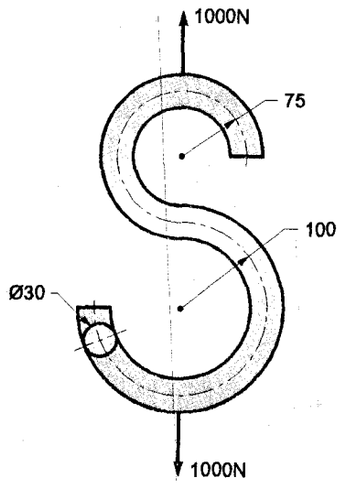
Q.4 A 3 m cantilever beam is loaded with a point load of 10kN at its free end. Find the cross section of the beam. The maximum bending stress is not to exceed 5 N/mm^2 and the maximum deflection is restricted to 8 mm. Take E = 2×10^4 N/mm^2. **(10)**

Q.5 A symmetrical I – section has flanges of size 180mm × 10mm and its overall depth is 500mm. the thickness of web is 8mm. It is strengthened with a plate of size 240mm× 12mm on compression side. Find the moment of resistance of the section, A = 10320 mm^2 if the permissible stress is 150 N/mm^2. How much uniformly distributed load it can carry if it used as a cantilever of span. **(10)**

OR

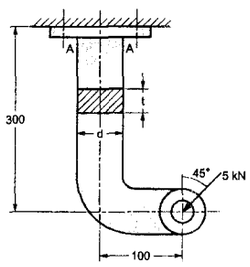
Q.5 Three planks each 50mm × 200mm are arranged to form an I – section. The section is subjected to a shear force 14kN. Suggests an alternative rectangular section of the same material so that the same maximum shearing stress is produced due to the same shear force. The width of the rectangular section shall be two – third of the depth. **(10)**

Q.6 A link of 'S' shape, made of ϕ 30mm bar is shown in figure. Determine the maximum tensile stress and shear stress in the link. **(10)**



OR

Q.6 A bracket shown in figure is subjected to a pull of 5kN acting at an angle of 45^0 to vertical. The bracket has a rectangular section whose depth is two times its thickness. If the permissible stress is $55N/mm^2$ determine the cross - section of the bracket. **(10)**



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