R13

B.Tech II Year I Semester (R13) Supplementary Examinations June 2016
MECHANICS OF SOLIDS
(Mechanical Engineering)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
   (a)   What is the meaning of the word 'Universal' in the universal testing machine?
   (b)   What is Mohr's circle and what is its significance?
   (c)   What is a point of inflection?
   (d)   If the area under the shear force diagram for a beam between two points is 'M', then the difference between the moments at the two point is?
   (e)   Define Neutral plane of the beam and Neutral axis of cross-section of a beam.
   (f)   Define term torsional rigidity and polar moment of inertia.
   (g)   A simply supported beam of span 'L' and flexural rigidity EI is acted upon by a concentrated load 'W' at the mid-span. The maximum deflection of beam is.
   (h)   Give the relationship between longitudinal and hoop stress as applicable to a thin pressure vessel.
   (i)   Differentiate between a thin cylinder and thick cylinder.
   (j)   The stress at a point in an elastic body is: (i) Scalar. (ii) Vector. (iii) Tensor. (iv) Point function.

PART – B
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2   A square pin is required to resist a pull of 40 kN and shear force of 15 kN. Derive a suitable section required according to strain energy theory maximum elastic stress in tension is 350 N/mm^2 and Poisson ratio is 0.3.

OR

3   A cylinder piece of steel 80 mm diameter and 120 mm long is subjected to an axial compression force of 500 kN. Calculate the change in the volume of the piece, if the bulk modulus 1.7×10^5 N/mm^2 and Poisson ratio is 0.3.

UNIT – II

4   A beam ABCD is supported at 'B' and 'C' and has overhanging AB and CD. The bending moment diagram for this beam shown below. Determine loading diagram and SF diagram for the beam.
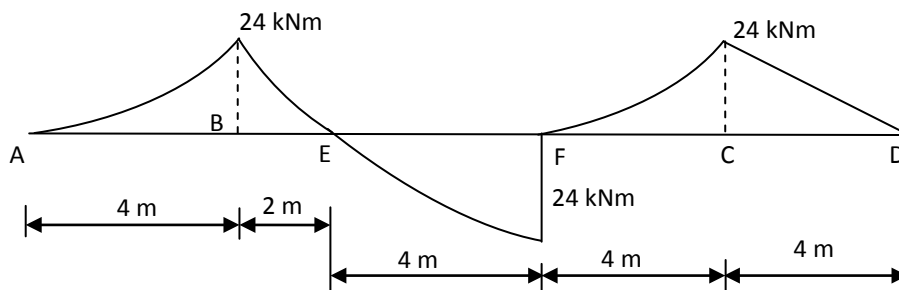
OR

5   The diagram given below is the SF diagram for a beam which rest on two supports, one being on the left hand end. Deduce directly from the SF diagram.
   (i) The BM at 2.0 m interval along the beam.
   (ii) The loading on the beam and also draw loading and BMD diagrams.
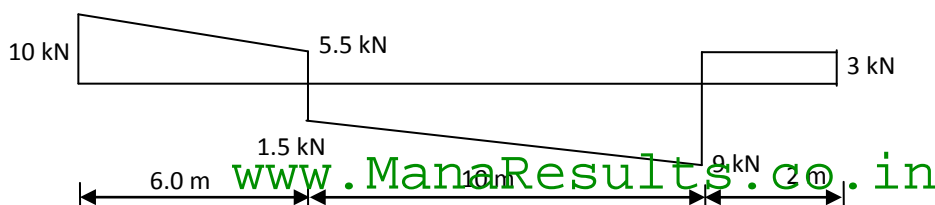
UNIT – III

6   A rectangular beam is to be cut from a circular log of diameter 'D'. Find the ratio of breadth to depth for a strongest section in bending.

OR

7   The T – section shown in figure below, is subjected to a SF of 80,000 N at a section. Find the maximum shear stress in the section and show the variation of shear stress in the section.
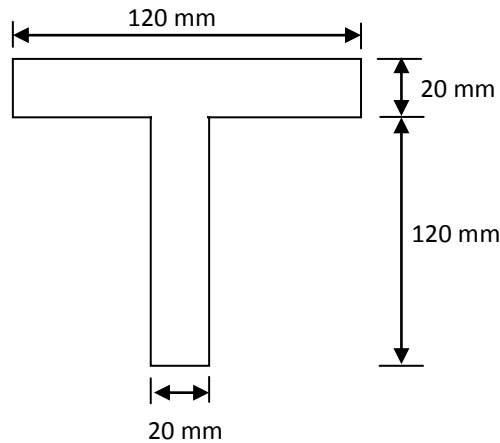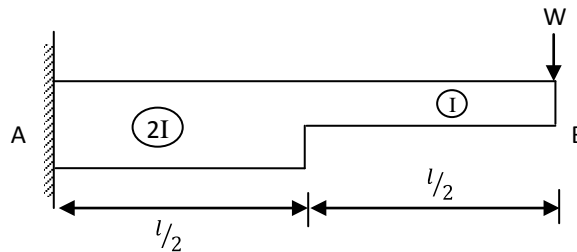

UNIT – IV

8   Find the maximum torque that can be applied safely to a shaft of 300 mm diameter. The permissible angle of twist is 1.5 degree in a length of 7.5 m and shear stress is not exceed 42 N/mm^2. Take G = 84.4 N/mm^2.

OR

9   Find the slope and deflection at the free end for a cantilever beam shown in figure below. Use moment – area theorem to find slope and deflection.

UNIT – V

10   A cylinder shell 90 cm long, 15 cm internal diameter having thickness of metal 8 mm is fitted with fluid at atmospheric pressure. If an additional 20 cm^3 of fluid is pumped into the cylinder find the:
     (i) Pressure exerted by the fluid on the cylinder.
     (ii) Hoop stress induced. Take E = 200 GPa and Poisson ration = 0.3.

OR

11   In a hydraulic press, the cylinder has an internal diameter of 30 cm; the cylinder has to withstand an internal pressure of 10 MPa, without the material being stressed beyond 20 MPa. Determine the thickness of the metal and the stress on the outer surface of the thick cylinder.

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