Exam Date & Time: 05-Mar-2021 (02:00 PM - 05:00 PM)

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

THIRD SEMESTER B.TECH END SEMESTER EXAMINATIONS, MARCH 2021

STRENGTH OF MATERIALS [AAE 2173]

Marks: 50 **Duration: 180 mins.**

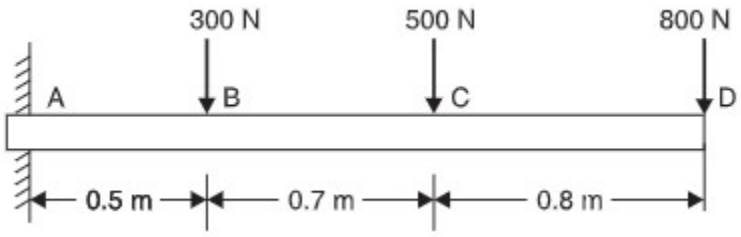
A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) A cantilever beam of length 2m carries the point loads as shown in figure 1. Draw the shear force and shear force diagram for the cantilever beam.

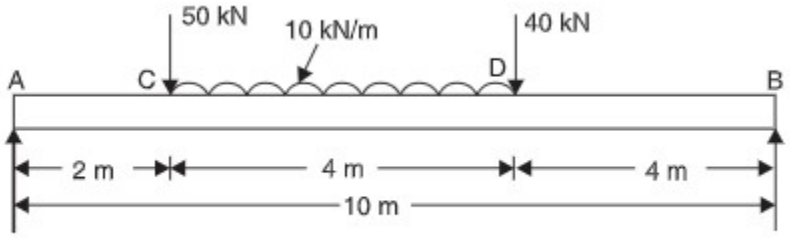
A)



(2)

Figure 1

B) A simply supported beam of length 10m, carries the uniformly distributed load and two point loads as shown in the figure 2. Draw the S.F. and B.M. diagram for the beam also find the maximum bending moment.



(3)

Figure 2

C) Draw the shear force and bending moment diagram for the 9m long simply supported beam loaded as shown in the figure 3. and also find the maximum bending moment and point of contraflexture.

(5)

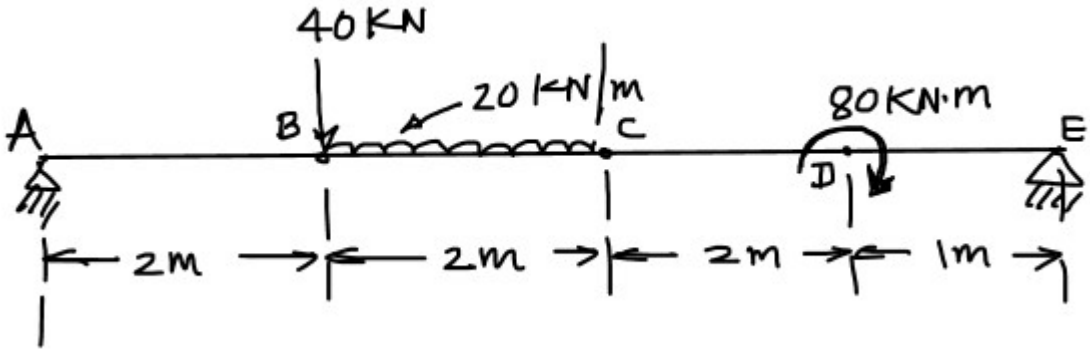
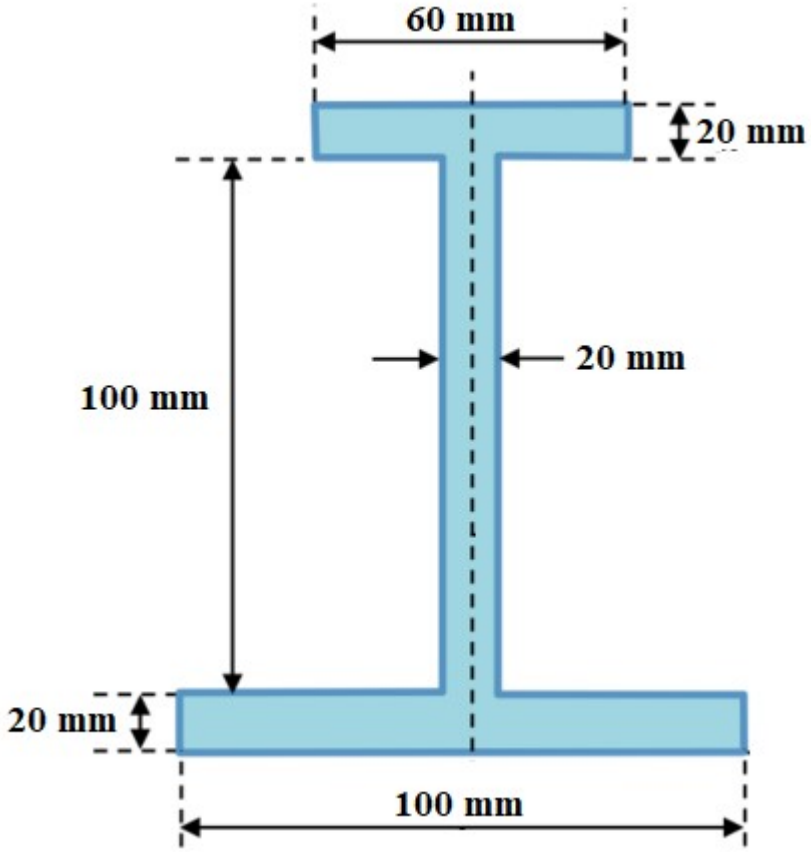


Figure 3

2) The beam of I section shown in the figure 4 is simply supported over a span of 4m. Determine the load that the beam can carry per meter length, if the allowable stress of the beam is 30.82 N/mm^2.

A)



(5)

Figure 4

B) A simply supported beam of length 4m carries a point load of 16kN at a distance of 3m from left side support. The cross-section of the beam is shown in the figure 5. Determine the maximum tensile and compressive stress at a section which is at a distance of 2.25m from left side (5)

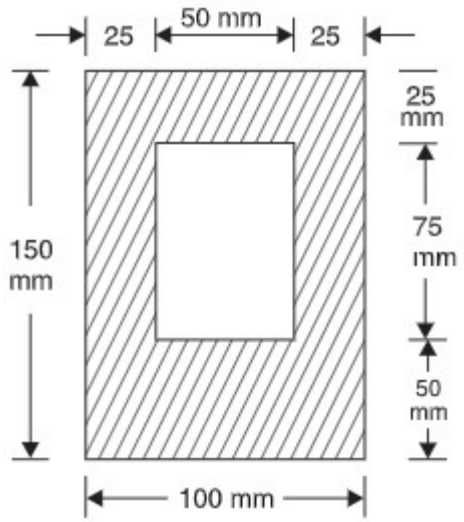
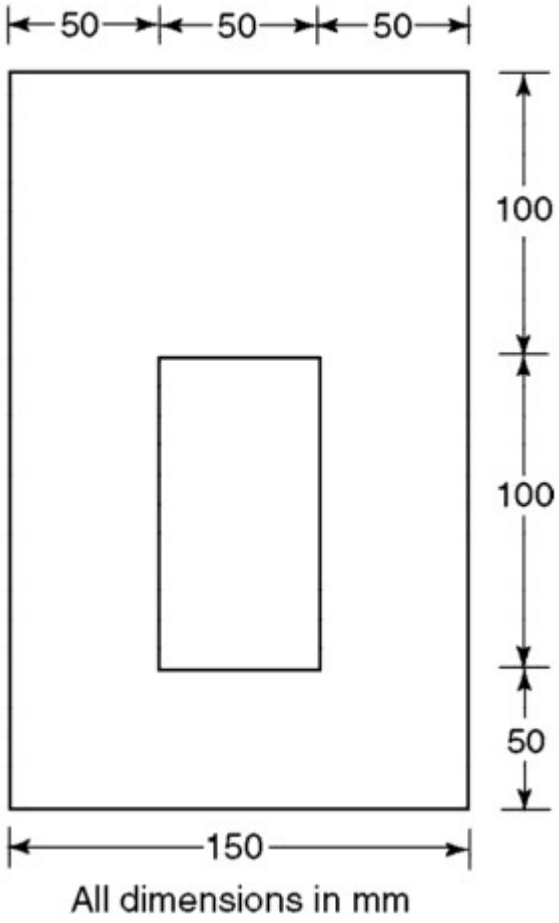


Figure 5

3) A cantilever beam of 1 m span in a machine part is having cross section as shown in the figure 6. The permissible stress in the tension and compression are 20 N/mm^2 and 80 N/mm^2 respectively. Find the maximum load W it can carry at the free end.

A)



(3)

Figure 6

B) A timber beam is designed to carry a load of 5kN/m over a simply supported span of 6m. The permissible stress 10 N/mm^2. Take depth as twice of breadth. Design the beam. If the permissible stress in shear is 1 N/mm^2, check for shear (2)

C) A beam of 6m is simply supported at the end and carries two-point load of 48 kN and 40kN at distance of 1 m and 3 m respectively from left support. Take E= 2X10^5 N/mm^2 and I= 85X10^6 mm^4. Using Macaulay's Method to find, deflection under each load, maximum deflection and the point at which maximum deflection occurs. (5)

4) A cast iron bracket if I section as shown in figure 7, has its top flange is 200 mm and 40 mm, bottom flange as 120 mm and 40mm and the web is 300 mm and 40mm. Overall depth of section is 380 mm. If the beam is subjected to a sheer force of 150kN. Sketch

A) distribution over depth of section. (6)

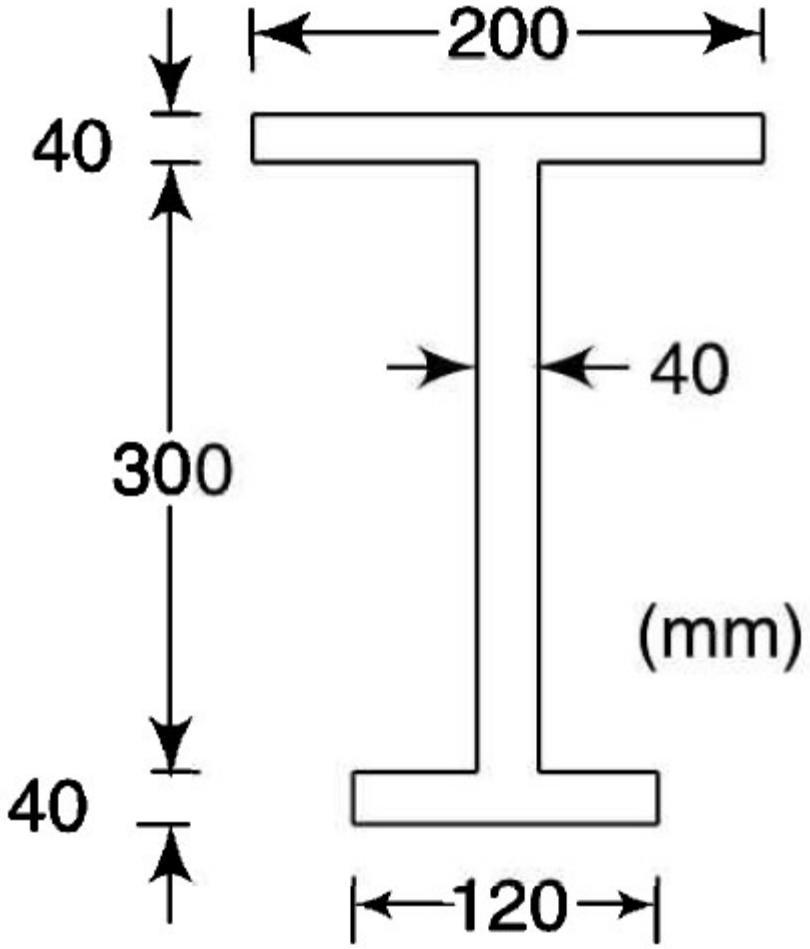


Figure 7

B) A thick cylinder of internal diameter 160mm is subjected to an internal pressure 40 N/mm2. If the allowable stress us the material is 120 N/mm2, find the thickness required. (4)

5) A hollow shaft having as inside diameter 60% the outer diameter, is to replace as solid shaft transmitting the same power at the same speed. Calculate the percentage saving in material, if material to be used is also same. (4)

A)

B) Derive the equation for hoop stress in the thin cylinder. (2)

C) A shaft ABC of 500m length and 40mm extremal diameter is bored, for a part of its length AB, to a 20 mm diameter and for the remaining length BC to a 30 mm diameter bore. If the shear stress is not to exceed 80 N/mm^2, find the maximum power, the shaft can transmit at a speed of 200 r.p.m. (4)

If the angle of twist in the length of 20 mm diameter bore is equal to that in the 30 mm diameter bore, find the length of the shaft that beam bored to 20mm and 30mm diameter.

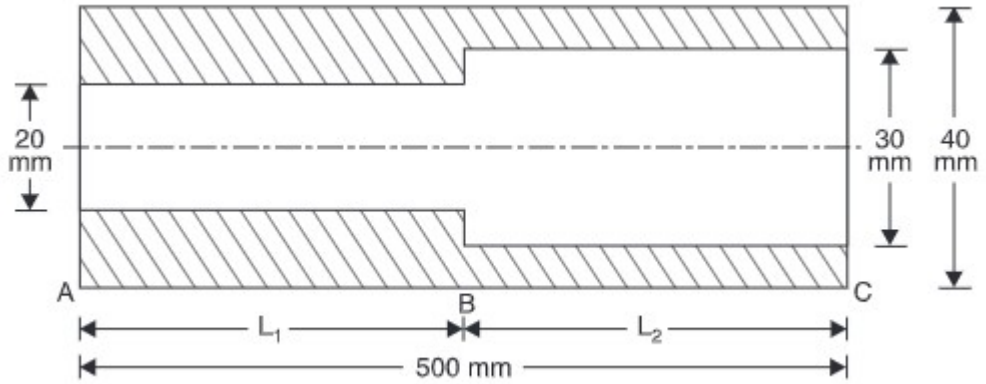


Figure 8

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