15022

B. Tech 1st Semester Examination

Engineering Mechanics (NS)

BE-105

Time : 3 Hours   Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Question paper has five section. Attempt one question each from section A, B, C and D. Section E is compulsory. Attempt all subparts of Section E.
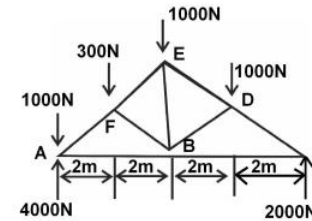
SECTION - A

1. (a) Find moment of Inertia of a circle about its diametrical axis.   (12)

    (b) The crate of 500N is hoisted using ropes AB and AC. Each rope can withstand a maximum tension of 2500N before it breaks. If AB remains horizontal determine the smallest angle θ to which carte can be hoisted.   (8)
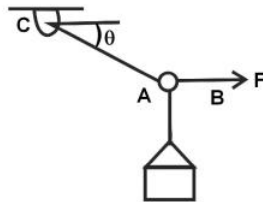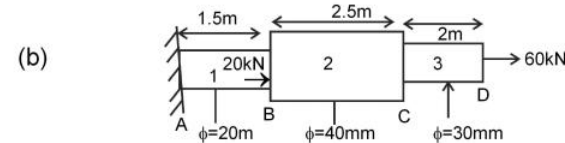

2. Determine the force in member EB of the roof truss and indicate whether member is tension or compression.   (20)
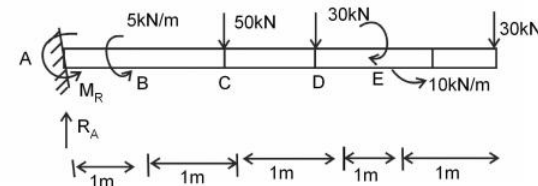
SECTION - B

3. (a) A 2m steelbar of diameter 15nm is subjected to an initial pull of 50kN. Calculate the change in length, diameter, volume of bar if the poisson's ratio is 0.25. Also find the work done in stretching the bar. Take E = 200 kN/mm^2.   (8)

    (b)

    A rod consists of three bars of unequal diameters. Their diameters are shown above. The lengths are AB=1.5m BC=2.5m, CD=2.0m. Find the stress in each bar. Also find the elongation of rod, take E=200kN/mm^2.   (12)

4. (a) Find the relation between load, shear force and bending moment.   (8)

    (b) Find the reaction at the fixed end of the cantilever loaded as shown below. Also find the shear force and bending moment diagram.   (12)

SECTION - C

5. A simple beam of length 5m carries two types of load a uniform distributed load of 6kN/m is acting over the entire span and a point load of 2kN at a distance 2m from the left support. Crossection of the beam is shown in Fig. b. Calculate the maximum bending stresses at a distance 3.5m from left support.

Fig b
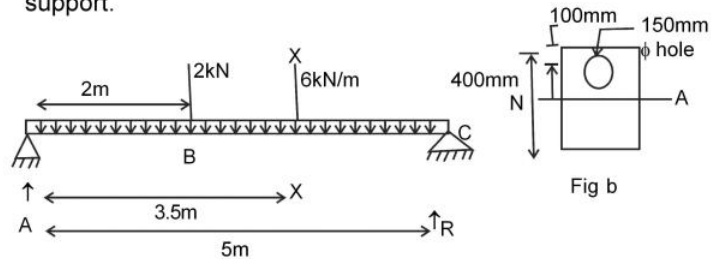
Distance of hole from top to centre is 100mm.   (20)

6. Find relation for shear stress distribution in an I section of the beam and also plot the variation across the entire section both in flange and web.   (20)

SECTION - D

7. A Solid circular shaft transmits a power of 100kW at 1500 r.p.m. For a limiting shear stress of 70mPa, find diameter of the shaft. The solid shaft is replaced by a hollow shaft with inside diameter being equal to 0.75 times the outside diameter. What percent of saving in weight can be achieved by the replacement if both shafts are equal length, made of some material, being subjected to equal maximum shear stress and are transmitting equal powers at same speed?   (20)

8. (a) Find the relation for close coiled helical spring subjected to an axial load, strain energy stored in it.   (12)

   (b) Describe in detail the procedure for friction analysis. (8)

SECTION - E

9. (i)   Define factor of safety.

   (ii)   What are different types of loads which can act on beam?

   (iii) Define young's modulus, shear modulus and bulk modulus.

   (iv)   What is polar modulus?

   (v)   State varignon's theorem.

   (vi)   Define angle of friction.

   (vii) Define torsional rigidity.

   (viii) What are remedial measures in overcoming friction?

   (ix)   What are laws of friction?

   (x)   What are statically determinate and indeterminate beams?   (2×10=20)