[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2126)

16019(D)

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 sections A, B, C, D and E. Attempt one question each from section A, B, C & D. Section E is compulsory. Attempt all subpart of question 9.

SECTION - A

1. (a) Find the centroid of area bounded by x axis, line x=a and the parabola $y^2=kx$ as shown in Fig. 1 below. (10)

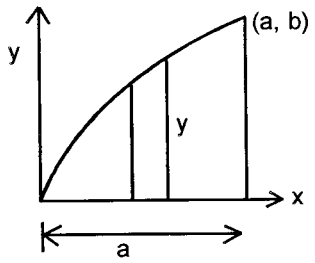


Fig. 1

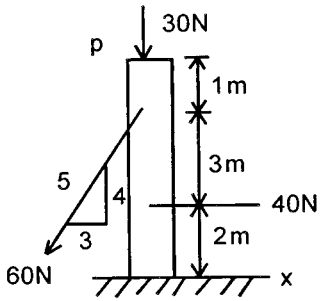
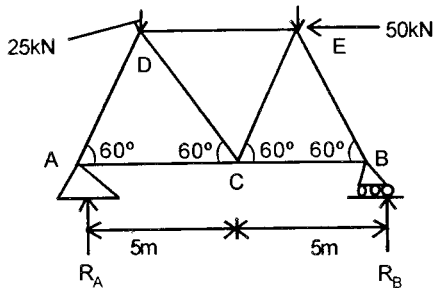


Fig. 2

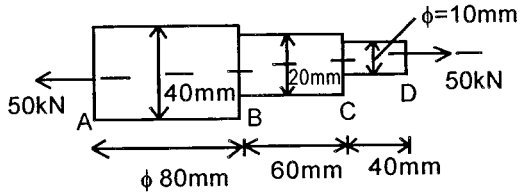
(b) Replace the load acting on post by equivalent resultant force and couple moment at p as shown in Fig. 2 above. (10)

2. In warren truss, each triangle of which is an equilateral one having 5 m side, Find out forces in all members of truss. (20)



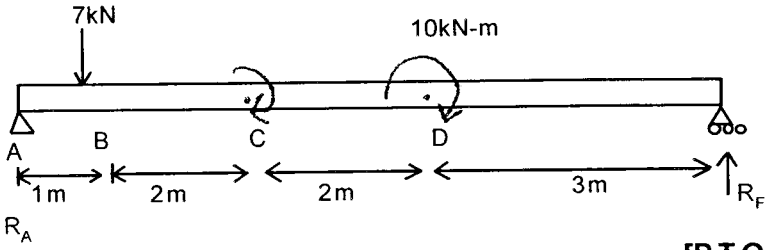
SECTION - B

3. (a) A bar of different cross sections in subjected to a tensile force of 50 kN. Find the stresses in different sections and total elongation produced in the bar. Take E=200kN/mm^2. (10)



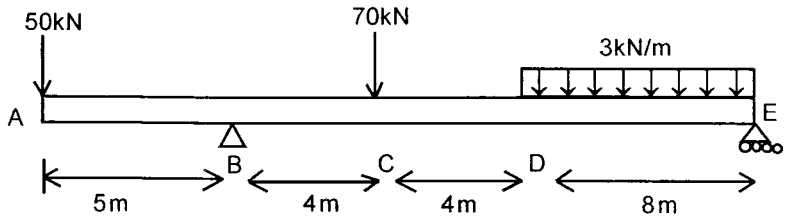
(b) A 3 metre solid rectangular bar of crosssection 10mm×15mm is subjected to a compressive force of 150kN. What is the change in length of bar? Also find strain and stress produced in the bar. E=2×10^5 N/mm^2. (10)

4. (a) Draw shear force and bending moment diagram for the beam shown below. (10)



[P.T.O.]

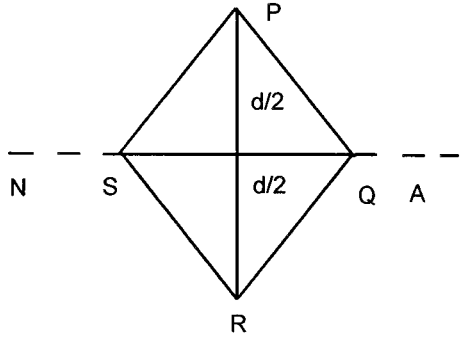
(b) Draw shear force and bending moment diagram for the beam. (10)



SECTION - C

5. Find the relation for shear stress distribution in a circular cross section. (20)

6. A beam of square cross section is placed on one of its diagonal horizontally. It is subjected to shear force F. Find the relation for maximum shear stress and plot its veriation. (20)

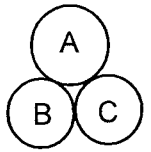


SECTION - D

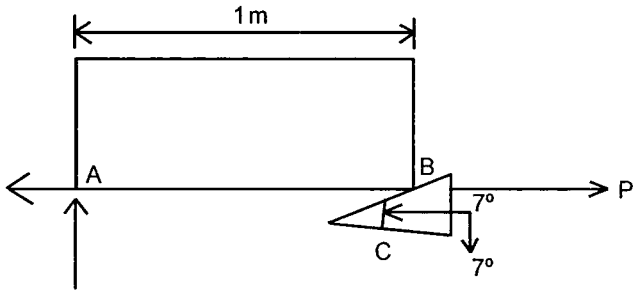
7. (a) Find the relation for strain energy of a close coiled spring subjected to an axial twist. (10)

(b) Derive the equation for torque transmitted by a circular member stating assumptions made. Define polar modulus. (10)

8. (a) Three concrete pipes of equal diameter are stacked as shown below. Determine the minimum coefficient of static friction at each point so that pile does not collapse. (10)



(b) The uniform stone has a mass of 500kg and is held in the horizontal position using a wedge at B. If the coefficient of static friction is μ_s=0.3 at the surface of contact, determine the minimum force P needed to remove the wedge. Assuming that the stone doesnot slip at A. (10)



SECTION - E

9. (i) Define Poisson's ratio.

(ii) Find the relation for thermal stress and strain in a compound bar.

(iii) Define moment of Inertia.

(iv) Derive the relation between shear force and bending moment.

(v) What is section modulus?

(vi) State Lami's theorem.

(vii) What are characteristics of dry friction?

(viii) List methods for overcoming friction.

(ix) Define and determine angle of friction.

(x) What are elastic constants? (2×10=20)