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NATIONAL INSTITUTE OF TECHNOLOGY CALICUT

ZZ1001 ENGINEERING MECHANICS

Test 2 - Winter semester 2010-11

Marks: 20

Time: 75 minutes

Answer all questions. Read questions carefully before attempting to answer.

For the problems in dynamics do not use any formula (except the Newton's laws) without deriving it!

1. Find the forces in the members of the truss shown in Fig.1 using method of joints. Tabulate the member forces and also indicate the nature of forces (tension or compression). [3]

2. Wooden wedges *B* and *C* are placed under the wooden deck *A* as shown in Fig.2. Knowing that $\theta=18^0$ and that the coefficient of static friction is 0.3 between all wooden surfaces and is 0.6 between the wedge *C* and ground, determine the magnitude of the clamping forces *P*, for which upward motion of the deck is impending. [4]

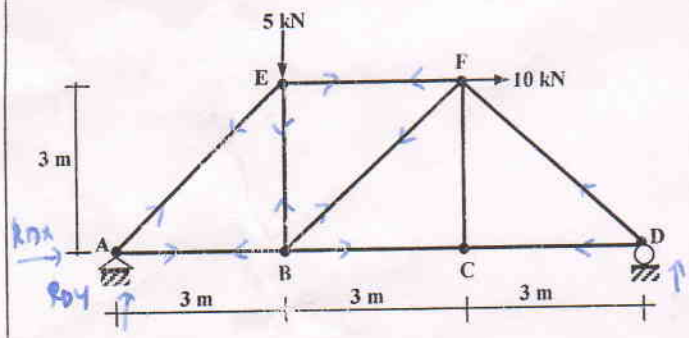

Figure 1

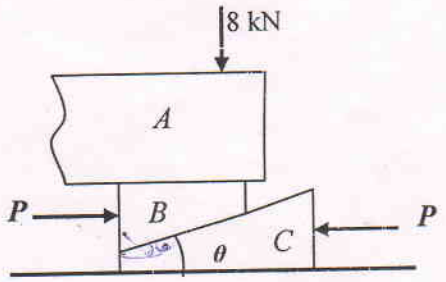

Figure 2

3. For the composite area shown in Fig.3, find the centroidal coordinates. The circular hole shown has a radius of 15 mm. [3]

4. Find the direction of the principal axes and the principal second moments of area at point A, for the section shown in Fig. 4. [4]

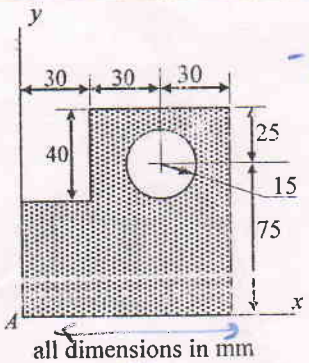

Figure 3

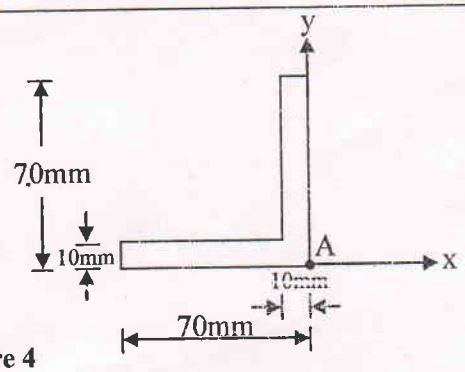

Figure 4

5. A man standing on the ground sloping at 15^0 to the horizontal sees a helicopter directly above him flying downhill at a speed of 144 km per hour. The pilot of the helicopter drops a packet at that instant. If the helicopter was at a height of 100m above the man when the packet was dropped, calculate (i) the time taken by the packet to hit the ground and (ii) the distance along the ground from the man to the point where the packet hits the ground. [3]

6. A fighter plane is flying at a height of 2000 m, directly above an anti-aircraft gun at time t=0. The plane is having a speed of 500 km/hr. A shell is fired from the gun, with a muzzle velocity of 1000 m/s, at t=0. Determine the angle of firing of the bullet, if the shell hits the plane. Use the concept of relative motion. [3]