Total No. of Questions : 6] [Total No. of Printed Pages : 5

[3861]-164

F. E. (Semester - II) Examination - 2010

ENGINEERING MECHANICS

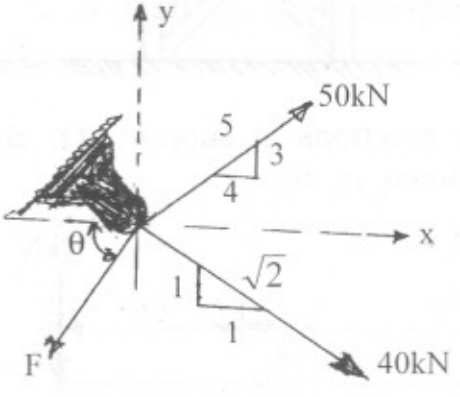
(2008 Pattern)

Time : 2 Hours] **[Max. Marks : 50**

Instructions :

(1) Attempt Q. 1 or Q. 2, Q. 3 or Q. 4 and Q. 5 or Q. 6.
(2) Answer should be written in one answer book only.
(3) Neat diagram must be drawn wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of cell phone is prohibited in the examination hall.
(7) Use of electronic non-programmable pocket calculator is allowed.

Q.1) (A) Determine Magnitude 'F' and direction 'θ' of force 'F', so that the resultant of three forces acting on hook is zero. **[06]**



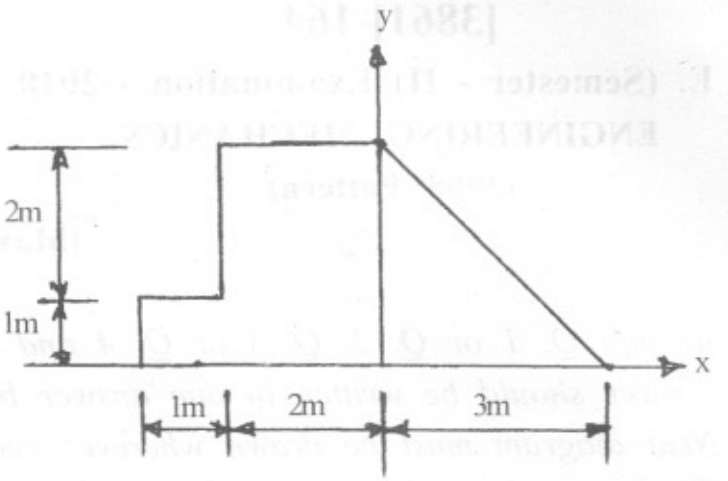
(B) A stone is thrown vertically upward from a point on bridge located 40m above water level. Knowing that it strikes water 4 sec. after release, determine :

(i) the speed at which stone was thrown upward.

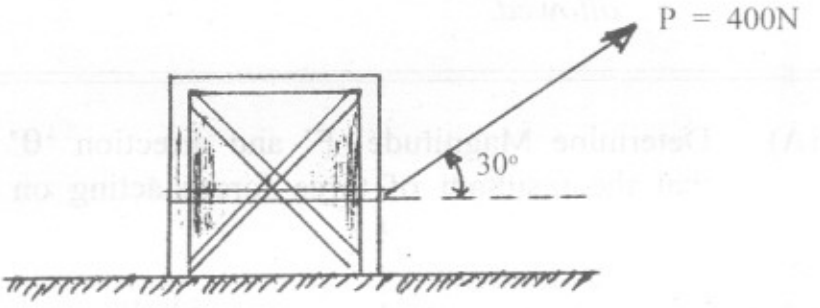
(ii) the speed with which it strikes water. **[06]**

OR

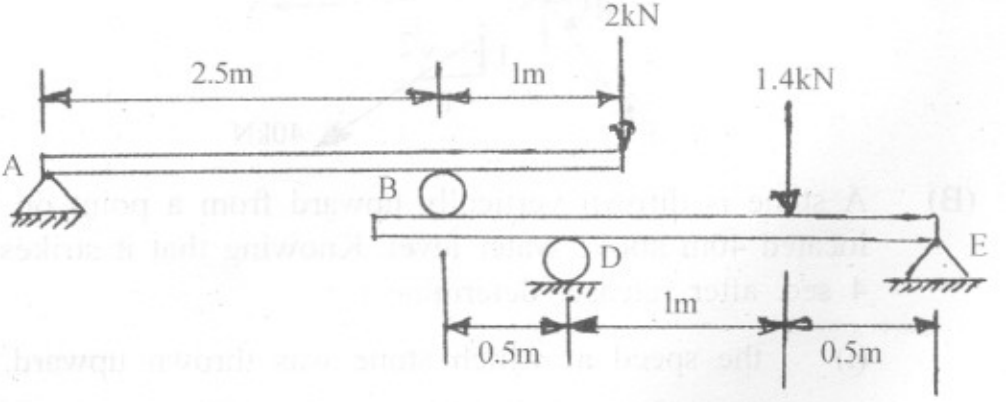
Q.2) (A) Locate Centroid of the plate as shown in fig. **[06]**



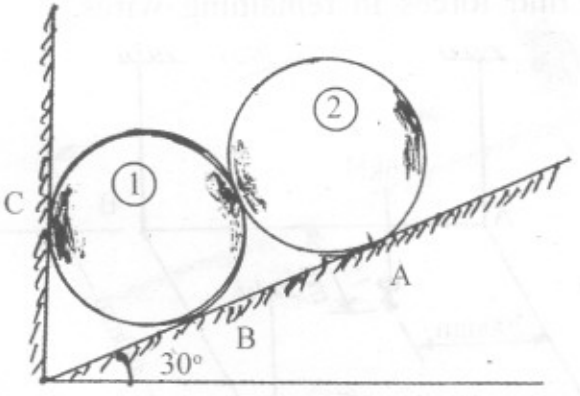
(B) The 50 kg crate as shown in fig. rests on a horizontal plane for which the coefficient of kinetic friction is $\mu k = 0.3$. If the crate is subjected to a 400N towing force, as shown, determine velocity of the crate in 5 sec. starting from rest. **[06]**



Q.3) (A) Find support reactions at support 'D' and 'E' for the beam system as shown in fig. **[06]**



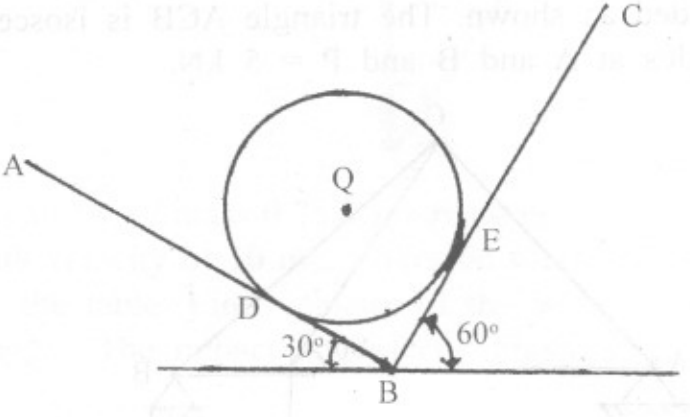
(B) Two identical rollers each of weight 445N are supported by an inclined plane and a vertical wall as shown in fig. Assuming smooth surfaces, find reactions induced at the points of support A, B and C. **[07]**



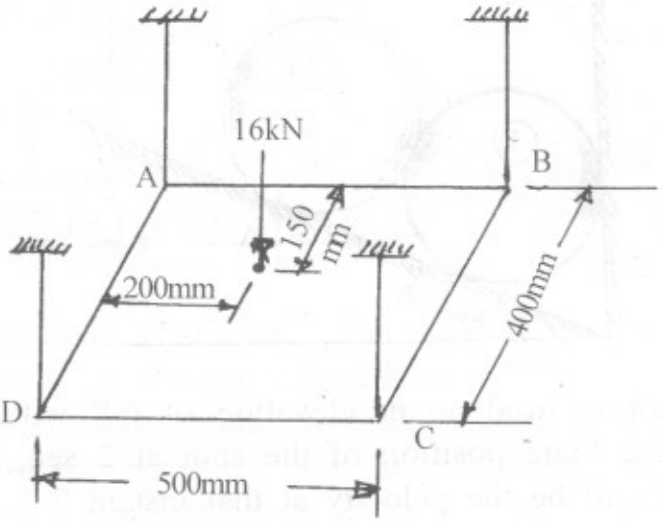
(C) A shot is fired at an elevation of 60° with a velocity of 60 m/s. State position of the shot at 2 sec. after firing. What will be the velocity at that instant ? **[06]**

OR

Q.4) (A) A ball of weight Q = 53.4N rests in a right-angled trough as shown in fig. Determine forces exerted on the sides of the trough at D and E if all surfaces are perfectly smooth. **[06]**

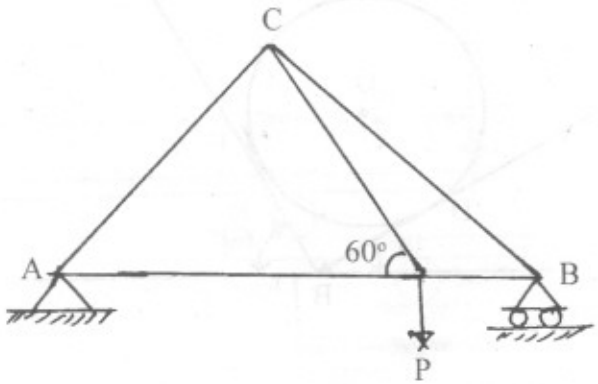


(B) A rectangular plate of negligible weight is held horizontally by four wires of equal length at A, B, C and D as shown in fig. A point load of 16 kN acts on the plate at 150 mm from AB and 200mm from AD. If the minimum force in any of the wires is 2.2 kN, find forces in remaining wires. **[07]**

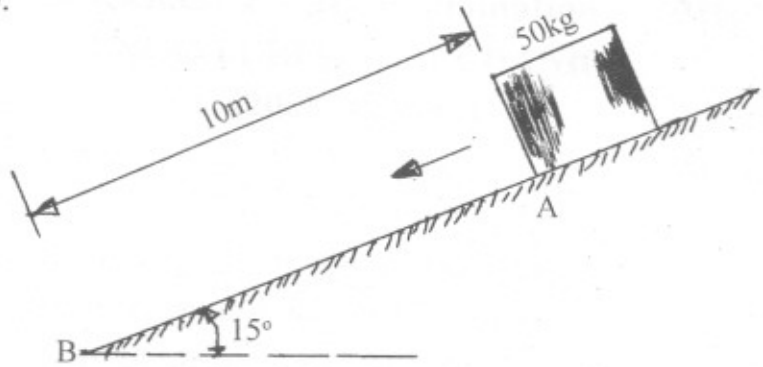


(C) A car starts from rest on a circular curve of radius 250m and accelerates at a constant tangential acceleration of $1.2 m/s^2$. Determine distance travelled and time taken when the magnitude of the total acceleration is $1.5 m/s^2$. **[06]**

Q.5) (A) Calculate axial forces in each bar of the simple truss supported and loaded as shown. The triangle ACB is isosceles with 30° angles at A and B and P = 5 kN. **[12]**



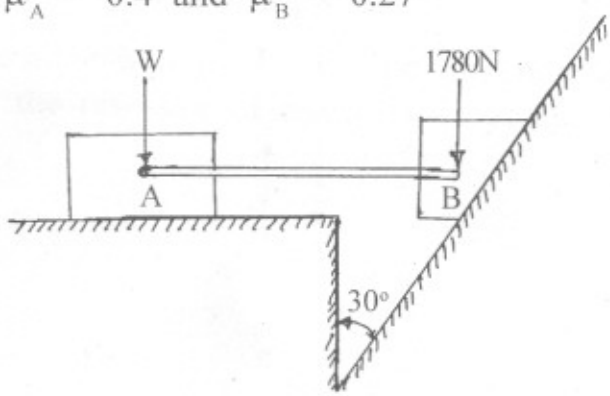
(B) Calculate velocity 'V' of the 50 kg crate when it reaches bottom of the chute at 'B' if it is given an initial velocity of 4m/s down the chute at A. The coefficient of kinetic friction is 0.30. **[07]**



OR

Q.6) (A) Two blocks connected by a horizontal link AB are supported on two rough planes as shown. What is the smallest weight 'W' of block A for which equilibrium of the system can exist ?

Take $\mu_A = 0.4$ and $\mu_B = 0.27$ **[12]**



(B) A ball 'A' of mass 0.25 kg moving on smooth horizontal table with velocity of 10 m/s strikes on identical stationary ball 'B' on the table. Find velocity of the ball 'B' just after the impact. The impact is perfectly plastic. **[07]**
