Total No. of Questions—**6**] [Total No. of Printed Pages—**8**

Seat No.	

[4956]-12

F.E. (Common) (II Semester) EXAMINATION, 2016

ENGINEERING MECHANICS

(2008 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**.

(*ii*) Neat sketches must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Use of electronic pocket calculator is allowed in the examination.

(*vi*) Use of cell phone is prohibited in the examination hall.

1. (*a*) Determine the resultant of three forces as shown in Fig. 1(*a*), if $\alpha = 50°$. [6]

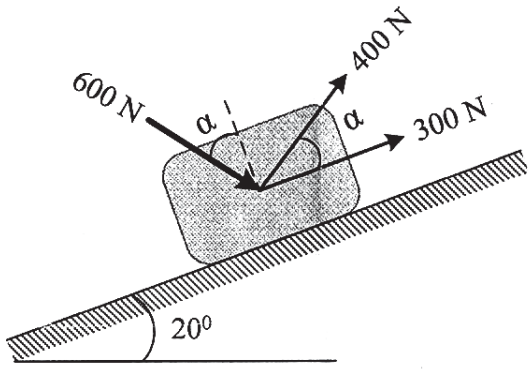

Fig. 1(*a*)

P.T.O.

(*b*) A base ball is thrown down from a 15 m tower with an initial velocity of 5 m/s. Determine the velocity with which it hits the ground and also determine the time of travel. [6]

Or

2. (*a*) A thin homogeneous wire ABC is bent as shown in Fig. 2(*a*). Determine the location of its centroid with respect to A. [6]

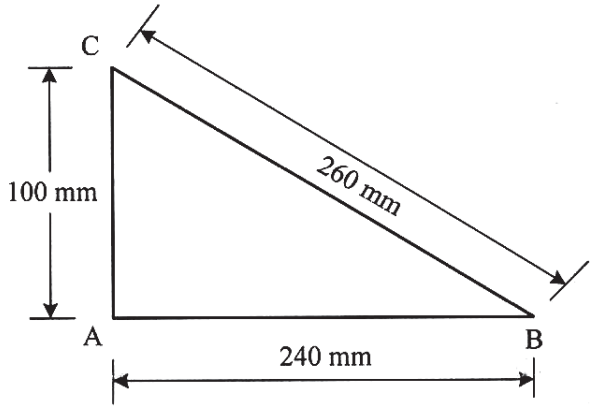

Fig. 2(*a*)

(*b*) A 90.7 kg block rests on a horizontal plane as shown in Fig. 2(*b*). Find the magnitude of the forces P required to give the block an acceleration of 3 m/s^2 to the right. The coefficient of kinetic friction between block and plane is μ_s = 0.25. [6]

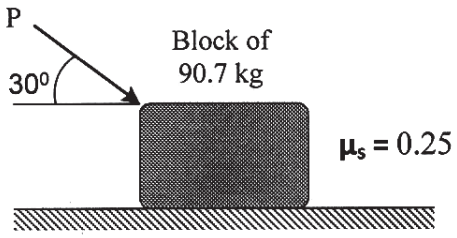

Fig. 2(*b*)

3. (*a*) The spring ABC has a stiffness of 500 N/m and an unstretched length of 6 m as shown in Fig. 3(*a*). Determine the horizontal force F applied to the cord which is attached to the small pulley C, so that the displacement of the pulley from the wall is d = 1.5 m. [7]

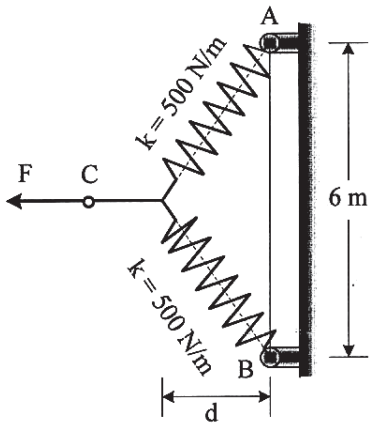

Fig. 3(*a*)

(*b*) The uniform concrete slab has a weight of 5500 N. Determine the tension in each of the three parallel supporting cables when the slab is held in the horizontal plane as shown in Fig. 3(*b*). [6]

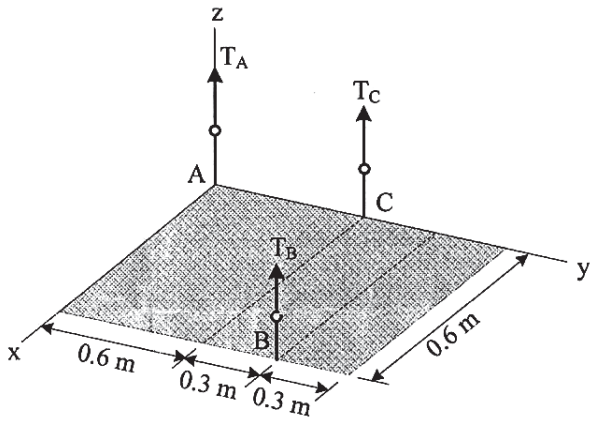

Fig. 3(*b*)

(*c*) A model rocket is launched from point A with an initial velocity v_0 = 86 m/s. If the rocket lands 104 m from A, determine :

(*a*) the angle α that v_0 forms with vertical,

(*b*) the maximum height reached by the rocket,

(*c*) the duration of the flight.

Refer Fig. 3(*c*). [6]

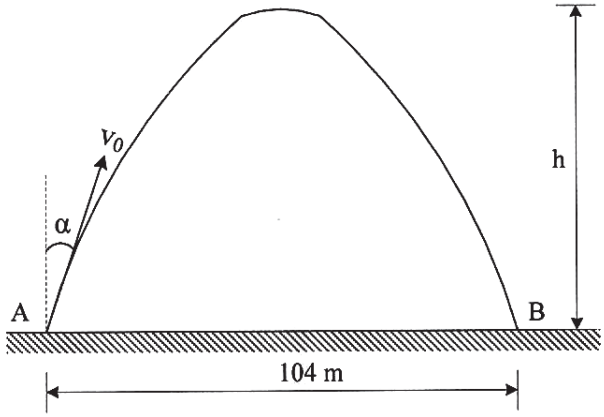

Fig. 3(*c*)

Or

4. (*a*) Determine the support reactions for a beam loaded and supported as shown in Fig. 4(*a*). [6]

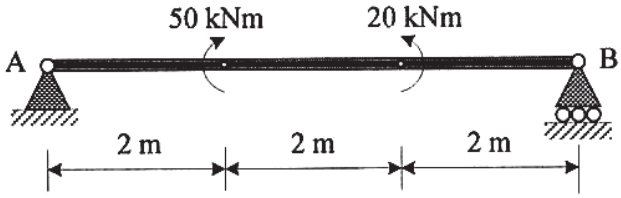

Fig. 4(*a*)

(*b*) A 16 kg triangular plate is supported by three wires as shown in Fig. 4(*b*). Knowing that a = 200 mm, determine the tensions in each wire. [7]

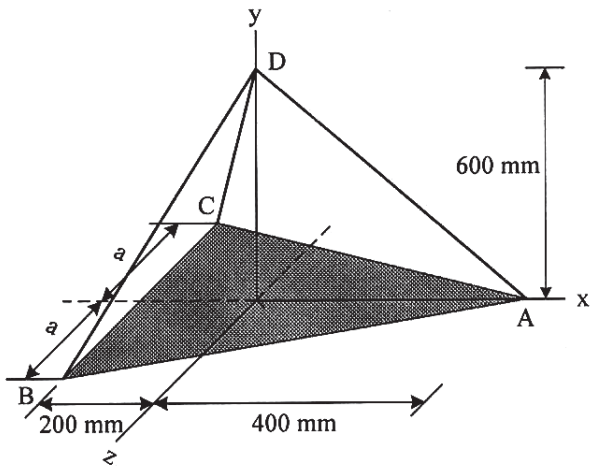

Fig. 4(*b*)

(*c*) A bob of 2 m pendulum describes an arc of a circle in vertical plane as shown in Fig. 4(*c*). If the tension in the chord is 2.5 times the weight of the bob for the position shown, determine the velocity and acceleration of the bob in that position. [6]

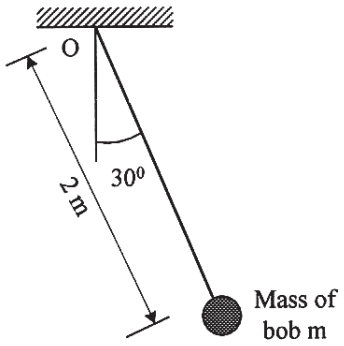

Fig. 4(*c*)

5. (*a*) Determine the forces in the members BD, BE and CE of the truss as shown in Fig. 5(*a*). State whether each member is in tension or compression. [7]

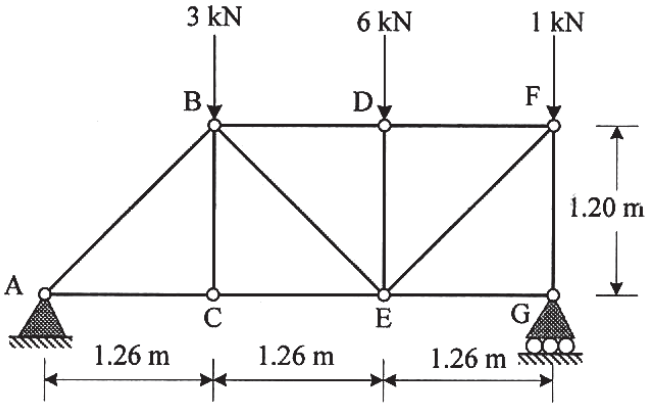

Fig. 5(*a*)

(*b*) A force P applied at B and a block attached at C to maintain the cable ABCD as shown in Fig. 5(*b*) is in equilibrium. Knowing that P = 1.32 kN, determine the reactions at A and magnitude of mass *m* of the block. [6]

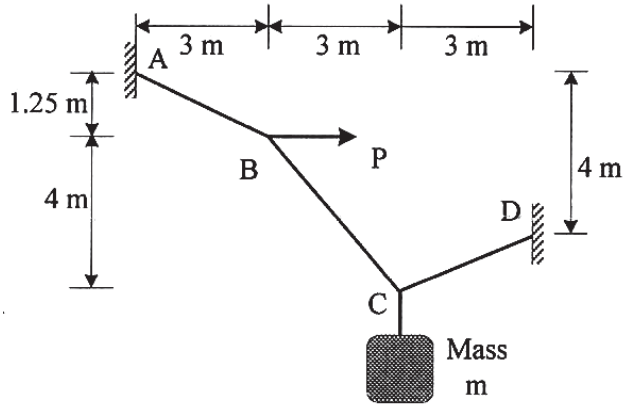

Fig. 5(*b*)

(*c*) A 40 kg package is at rest on the inclination as shown in Fig. 5(*c*), when a force P is applied. Determine the magnitude of force P if 4 seconds are required for the package to travel 10 m up the incline. The coefficients static and kinetic of friction between the package and incline are μ_s = 0.30 and μ_k = 0.25 respectively. [6]

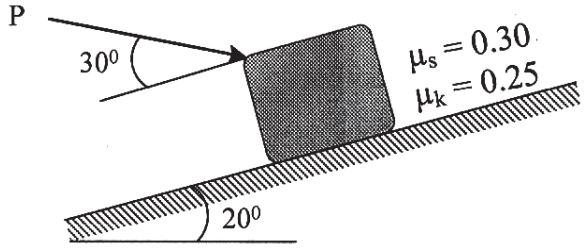

Fig. 5(*c*)

Or

6. (*a*) Determine the forces in the members DF, DE and EF of the truss loaded and supported as shown in Fig. 5(*a*). [7]

(*b*) A 0.54 kg ball A moving with a velocity u_A when it struck to a 1 kg ball B which is moving with with 5.5 m/s in opposite direction. Knowing that the ball B comes to rest after the impact and e = 0.8, determine the velocity of the ball A before and after impact. [6]

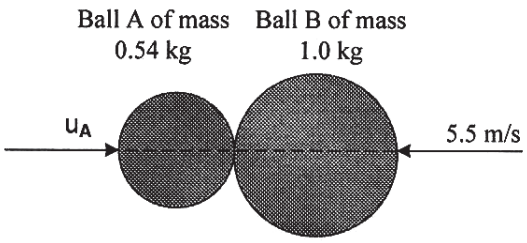

Fig. 6(*b*)

(*c*) Determine the maximum tension in the rope at points A and B that is necessary to maintain equilibrium as shown in Fig. 6(*c*). Take μ_s = 0.3 between the rope and fixed post D. [6]

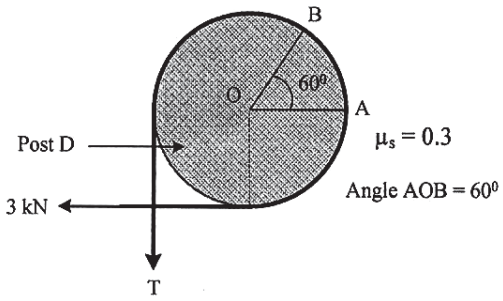

Fig. 6(*c*)