PIET's College of Engineering, Pune-5
End Semester Examination
(AM 101) Applied Mechanics

Programme:	**F. Y. B. Tech.**	**Branch and Specialization:**	**F Y All Branches**
Year	**: 2005-06**	**Date of Examination**	**: / / 2006**
Duration	**: 03 Hours**	**Max. Marks**	**: 60**

Instruction:

1) All questions are compulsory and carry equal marks.
2) Use of electronic pocket calculator is allowed.
3) Figure to the right indicates full marks.
4) Assume suitable data, if necessary.
5) Due credit will be given to the correct solution procedure and not to the final answer alone.
6) Draw neat diagram whenever necessary.
7) Use of cell phone is prohibited in examination hall.

Q. 1 a) Determine the design angle θ for strut AB so that the 400 N horizontal force has a component of 500 N directed from A towards C. What is the component of force acting along member AB? Take $\emptyset = 40^0$. Refer **Fig.1(a).** **(06)**

b) Determine the distance $\bar{y}$ to the centroid of the trapezoidal area in term of dimensions shown in **Fig.1(b).** **(04)**

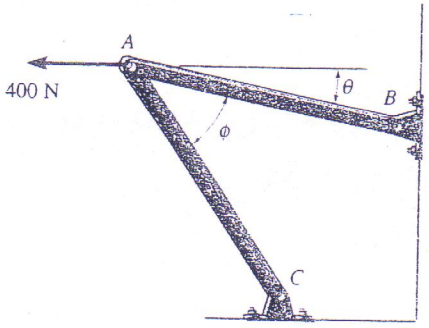

Fig. 1 (a)

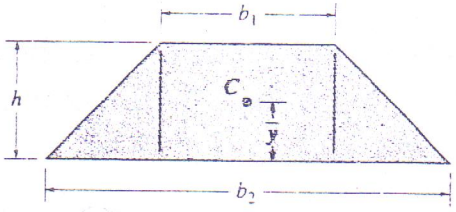

Fig. 1 (b)

2 a) A short semicircular right cylinder of radius r and weight W rest on horizontal surface and is pulled at right angles to its geometric axis by a horizontal force P applied at the middle B of the front edge shown in **Fig. 2(a).** Find the angle α that the flat face will make with horizontal plane just before sliding begins, if the coefficient of friction at the line of contact is $\mu = 0.25$. **(06)**

b) A cord having a weight of 0.5 N/m and a total length of 10 m is suspended over a peg P as shown in **Fig. 2(b)**. If the coefficient of static friction between the peg and cord is $\mu_s = 0.5$, determine the longest length h which one side of suspended cord can have without causing motion. Neglect size of peg and length of cord draped over it. **(04)**

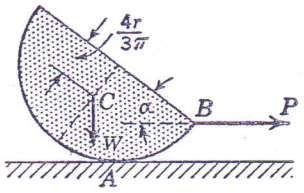

Fig. 2 (a)

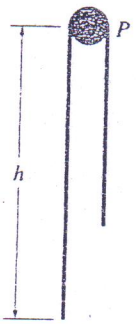

Fig. 2 (b)

Q. 3 a) Member AB and BC can support a maximum compressive force of 800 N, and members AD, DC and BD can support a maximum tensile force of 2000 N. If a = 6 m, determine the greatest load P the truss can support. Refer **Fig. 3(a).** **(06)**

b) The cable supports the loading as shown in **Fig. 3(b)**. Determine the magnitude of horizontal force P so that $x_B = 6$ m. **(04)**

OR

c) Determine the support reactions for the beam loaded and supported as shown in **Fig. 3(c)** by Virtual work method. **(04)**

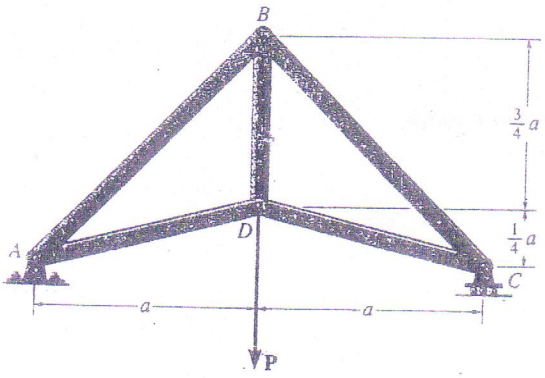

Fig. 3 (a)

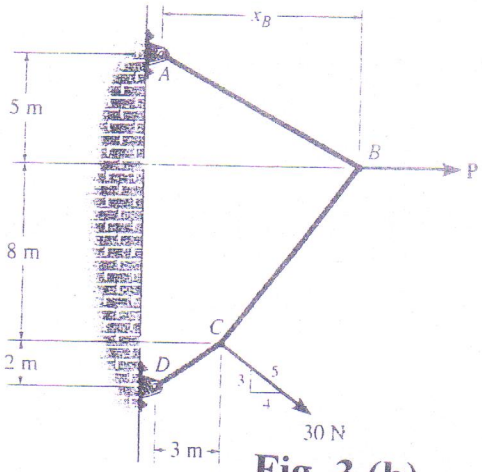

Fig. 3 (b)

Q. 4 a) A car starts from rest with an acceleration given by $a = 6 - 0.75t$ m/s^2. When the car reaches the maximum velocity it maintain constant velocity till it has gone a total distance of 200 m. Draw a-t and v-t curve for this motion and hence calculate time required for the car to travel 200 m from starting point. **(05)**

b) A particle has an initial velocity of 100 m/s up to right at 30^0 with the horizontal. The components of acceleration are constant at $a_x = -4$ m/s^2 and $a_y = -20$ m/s^2. Find the horizontal distance covered until the particle reaches a point 60 m below its original elevation. Refer **Fig.4(b)**. **(05)**

OR

c) The crank OA rotates at a constant rate of 80 rpm counter clockwise. At the instant shown, determine the angular velocity of the rod BC and the velocity of the mid point of rod AB. Refer **Fig. 4(c)** **(05)**

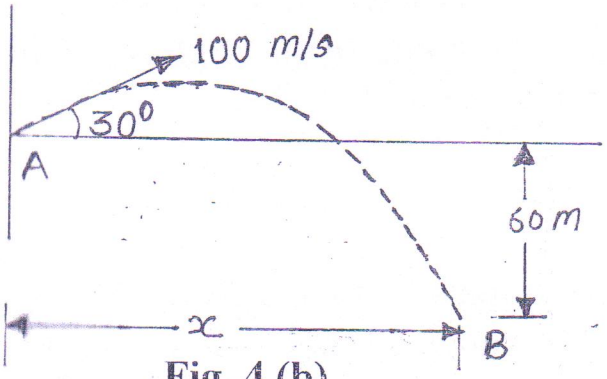

Fig. 4 (b)

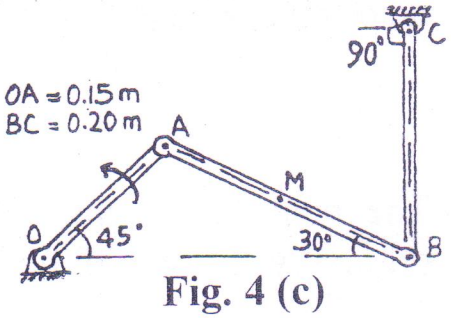

Fig. 4 (c)

5 a) Two 3 kg rod AB and AC are welded together shown in **Fig. 5(a)**. If the rods are released from rest, determine immediately after release, (a) the acceleration of point B, (b) the reaction at A. **(06)**

b) State and explain D'Alemberts principal . **(04)**

OR

c) The 50 kg crate is projected along the floor with an initial speed of 7 m/s at x = 0. The coefficient of kinetic frition $\mu_k = 0.4$. Calculate the time required for the crate to come to rest and corresponding distance x traveled. Refer **Fig. 5(c)**. **(04)**

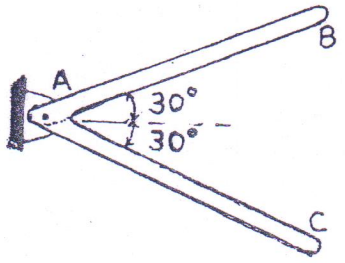

Fig. 5 (a)

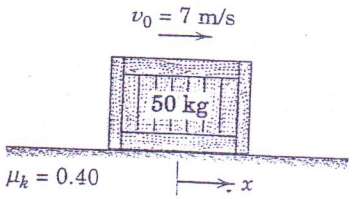

Fig. 5 (c)

Q. 6 a) Point P on the 2 kg cylinder has an initial velocity $v_0 = 0.8$ m/s as it passes position A.Neglect the mass of pulleys and cable and determine the distance y of point P below A when the 3 kg cylinder has acquired an upward velocity of 0.6 m/s. Refer **Fig. 6(a)**. **(06)**

b) The 4 kg cart, at rest at time t = 0, is acted on by a horizontal force which varies with time t as shown in **Fig. 6(b)**. Neglect friction and determine the velocity of the car at t= 1 s and t = 3 s. **(04)**

OR

c) The man M weighs 750 N and jumps onto the boat B which is originally at rest. If he has a horizontal component of velocity of

0.9 m/s just before he enter the boat, determine the weight of the boat if it has a velocity of 0.6 m/s once the man enter it. Refer **Fig. 6(c).** **(04)**

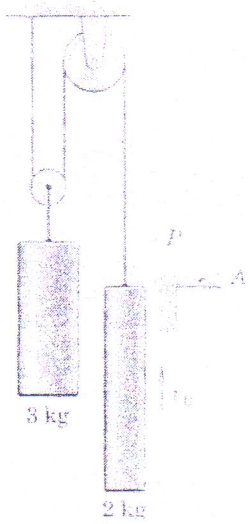

Fig. 6 (a)

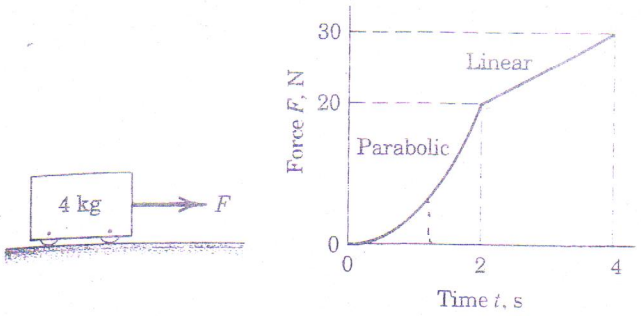

Fig. 6 (b)

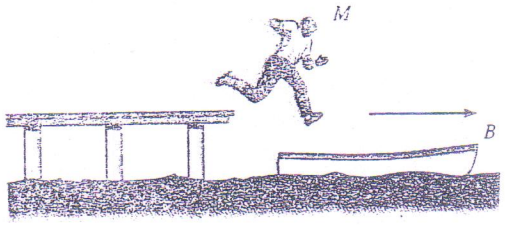

Fig. 6 (c)

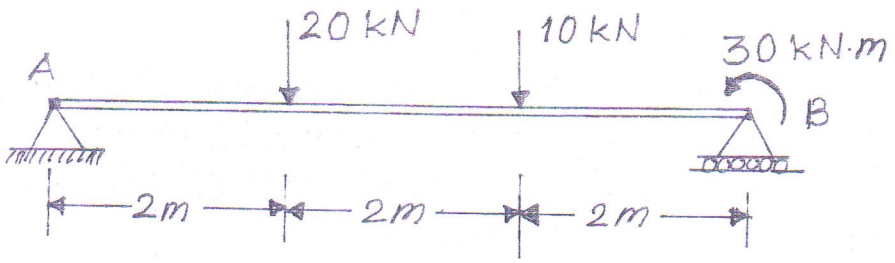

Fig. 3 (c)