Registration no: | | | | | | | | | | |

Total Number of Pages: 3 **B.Tech**
BE2104

1st Semester Back Examination 2016-17
MECHANICS
BRANCH(S): ALL
Time: 3 Hours
Max Marks: 70
Q.CODE: Y677

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**

a) If a rigid body is rotating at constant angular velocity about some axis, is the body said to be equilibrium or not? Explain the answer.

b) What is meant by a simple structure? Differentiate between plane truss and space truss.

c) What do you mean by angle of repose? Under what condition angle of repose is equal to angle of friction.

d) Under what condition centre of mass and centre of gravity coincide?

e) A stone is dropped into a well and splash is heard 2.50 seconds later determine the depth of the water surface assuming the velocity of sound is 330 m/s.

f) A body freely dropped from height H on to a flat surface rises to height h after rebound. What should be the value of co-efficient of restitution?

g) Write down the set of equations governing the dynamic behavior of a rigid body rotating about a fixed axis which is also its principal axis.

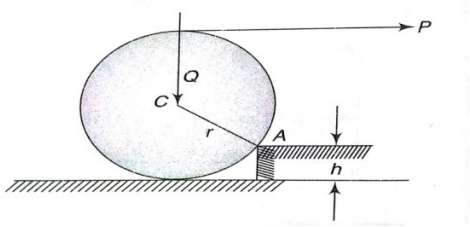
h) Under what circumstances the principle of virtual work is used in preference to the other formulations for equilibrium.

i) Compare the moment of inertia of an equilateral triangle about a side with moment inertia of a square of same area about its side.

j) Explain D'almbert's principle.

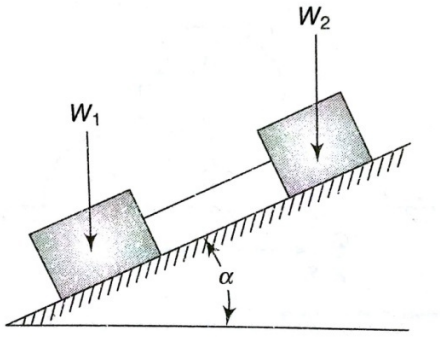
Q2 **a)** What is condition of equilibrium? **(2)**

b) A roller of radius r= 304.8 mm. and weight Q= 2225 N is to be pulled over a curb of height h=152.4 mm by a horizontal force P applied to the end of the string wound around circumference of the roller. Find the magnitude of P required to start the roller over the curb. **(8)**



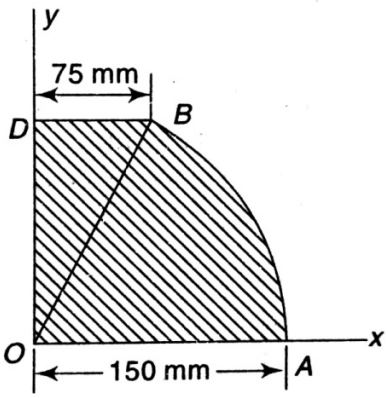
Q3 **a)** What are the laws of friction? **(2)**

b) Two blocks of weights W1 and W2 rest on a rough inclined plane and connected by a short piece of string as shown in the following figure. If the co-efficient of friction are μ1=0.2 and μ2=0.3, respectively, find the angle of inclination of the plane for which sliding will impend. Assume W1 =W2 = 25 N. **(8)**



Q4 **a)** Determine the centroid of the area between the parabola $y=x^2/a$ and the straight line y=x. **(5)**

b) Locate the centroid C of the shaded area OABD as shown in the figure. **(5)**

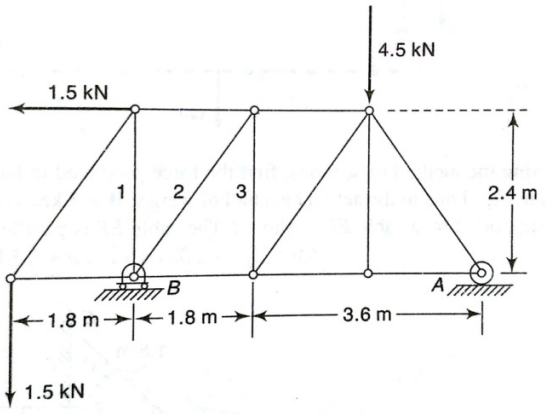


Q5 **a)** The acceleration of a particle is given by $a=t^3-3t^2+5$ m/s^2. Where the time t in sec. If the velocity of the particle at t=1 s is 6.25 m/s and displacement is 8.8 m, calculate velocity and displacement at t=2 s. **(7)**

b) State and prove perpendicular axis theorem. **(3)**

Q6 **a)** Draw a just rigid structure with five members. **(3)**

b) Determine the forces in the bars, 1, 2 and 3 of the plane truss as shown in the following figure. **(7)**



Q7 **a)** A tennis ball moving with a velocity of 25 m/s strikes the court at an angle 70° to the vertical. If the co-efficient of restitution is 0.75, find the velocity and direction of motion of the ball after the impact. **(5)**

b) The velocity of the particle is 100 m/s. When its angle of projection in upward direction is 30° with the horizontal. Find the time when the particle will move perpendicular to its initial direction. **(5)**

Q8 **Write short answer on any TWO:** **(5 x 2)**

a) Derivation of impulse-momentum equation.

b) State pappus first and second theorem. Verify the theorems with suitable example.

c) Advantages of method of section over method of joints.

d) Calculate the polar moment of inertia of a circular sector of radius r and central angle α with respect to it's centre.