Registration No : | | | | | | | | | | |

Total Number of Pages : 04 **B.Tech**

BE2104

2nd Semester Back Examination 2018-19

MECHANICS

BRANCH : AERO, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC, IT, MECH, MME

Time : 3 Hours

Max Marks : 70

Q.CODE : F091

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) What is law of transmissibility? State its limitations.

b) What is cone of static friction?

c) State Varignon's theorem.

d) Write the specifications of a force.

e) What is the difference between the moment of a force and moment of a couple?

f) State principle of Virtual work.

g) Resolve a force into another force and a couple.

h) What is the angle to get maximum range for a projectile?

i) Write the laws of friction.

j) Explain what you mean by plane truss.

Q2 **a)** Two identical rollers, each of weight Q=445N, are supported by an inclined plane and a vertical wall as shown in Fig.1. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C. **(5)**

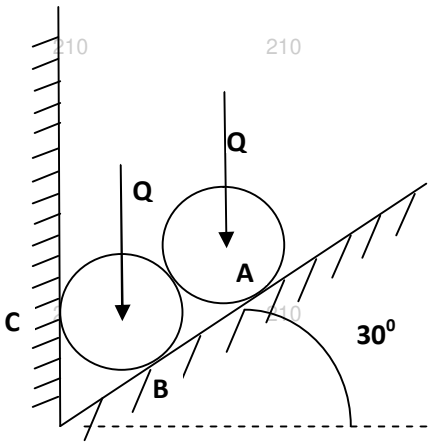

Fig. 1

b) A ball of weight 50N rests in a right-angled trough, as shown in Fig.2. Determine the forces exerted on the sides of the trough at C and D if all surfaces are perfectly smooth **(5)**

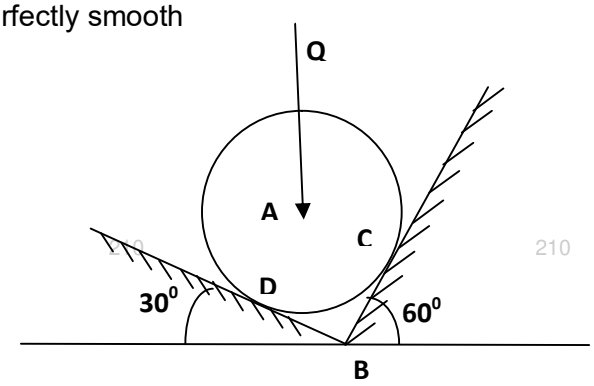

Fig. 2

Q3 **a)** i) Resolve the 4000 N force shown in Fig.3 into two parallel components P and Q acting, respectively, along a-a and b-b. **(5)**

ii) Resolve the same force into parallel components P and Q acting, respectively, along b-b and c-c.

iii) Resolve the same force into a force P at B and a couple.

Assume each small square is one unit.

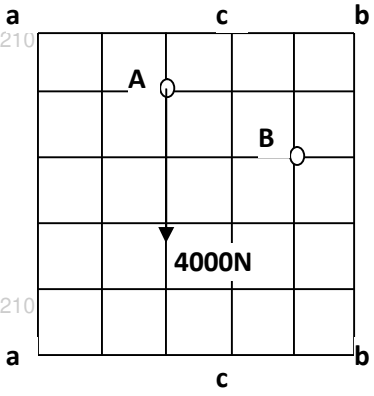

Fig. 3

b) Two beams are arranged as shown in Fig.4. Determine the reaction produced at the support C due to the action of a vertical load P applied to the beam AB as shown. **(5)**

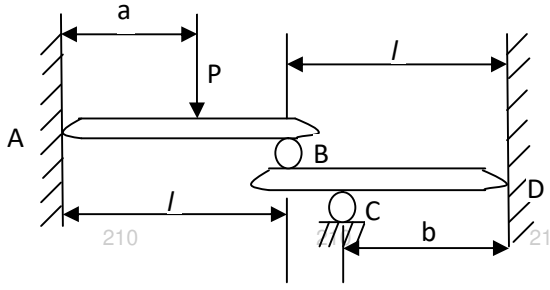

Fig. 4

Q4 **a)** Compute the reactions at the supports A and B of the beam loaded as shown in Fig. 5 if q_a =1500 N/m, and q_b =3000N/m. **(5)**

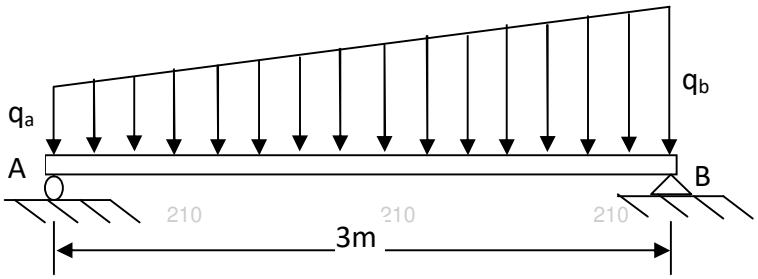

Fig. 5

b) Determine the force *S* in the bar CD of the simple truss supported and loaded as shown in fig.6. The triangle ABC is equilateral. **(5)**

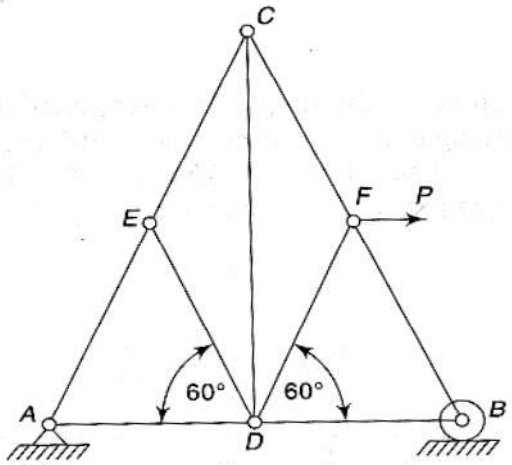

Fig. 6

Q5 **a)** A wood block weighing 50 N rests on a rough horizontal plane, the coefficient of friction between the two being μ =0.4. If a bullet weighing 0.5 N is fired horizontally into the block with muzzle velocity *V*=500m/s, how far will the block be displaced from the initial position? Assume that the bullet remains inside the block. **(5)**

b) Determine the dynamical deflection δ that will be produced at the centre of a simply supported beam by allowing a 17.8 kN weight to drop onto it from a height of 100mm. When gradually applied, the same load produces a static deflection of 2.5 mm. Neglect mass of the beam. **(5)**

Q6 **a)** A stuntman likes to cross the ditch as shown in Fig.7. Find the minimum velocity required at P. Also determine the direction and magnitude of velocity of the stuntman just at the instant of clearing the ditch. **(5)**

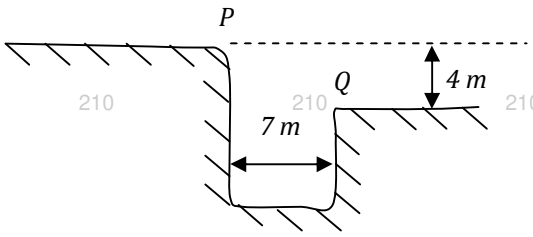

Fig. 7

b) A particle travels with constant speed v along a parabolic path defined by the equation $v = kx^2$, where k is a constant. Find the maximum acceleration of the particle. **(5)**

Q7 **a)** The position of a particle moving in a straight line is defined in the form $x = 5t^2 + 7t + 9$. Where *x* is in meter and *t* is in second. Determine it's displacement, velocity and acceleration at time t=0 and t=5 second. **(5)**

b) Neglecting friction and inertia of the two-step pulley shown in Fig.8, find the acceleration a of the falling weight P. Assume P=40N, Q=55N and $r_2=2r_1$. **(5)**

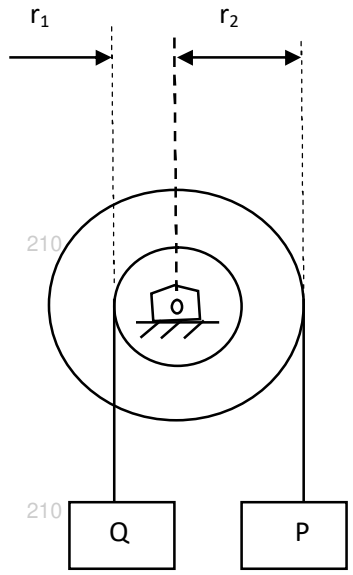

Fig.8

Q8 **a)** State and explain Pappus theorem- I and II using suitable examples. **(5)**

b) Locate the centroid C of the shaded area of circular segment BD shown in Fig. 9 **(5)**

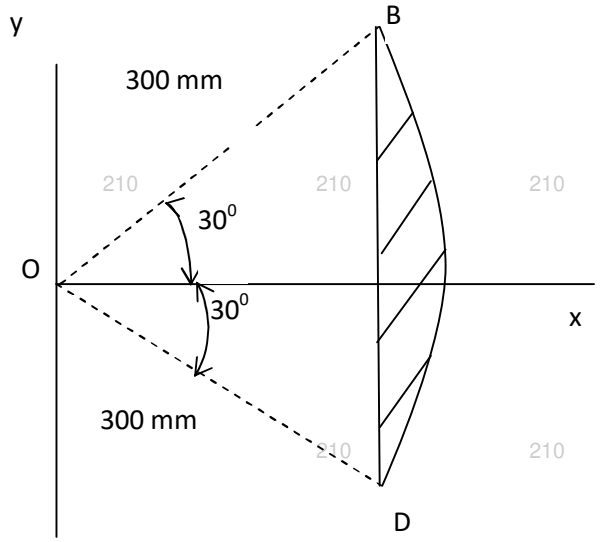

Fig. 9