(13)

Exam.Code:0906
Sub. Code: 6669

1059

B.E. (Mechanical Engineering) Second Semester

ME-201: Engineering Mechanics – II

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

x-x-x

Q1a)Write radial and transverse components of acceleration.

b)What is a potential function.

c) State the principle of linear impulse and momentum.

d) What is general plane motion. Give one example.

e) What is gyroscopic motion (10)

Part-A

Q2a)A motorist is driving at 80 km/hr on the curved position of a highway of 400 mm radius. He suddenly applies the brake and that causes the speed to decrease to 45 km/hr at a constant rate in 8 seconds. Determine the tangential and normal components of acceleration immediately after the application of brakes and 4 seconds later. (5)

b)A body is dropped from rest at height h. It covers a distance of 9h/25 in the last second. Determine the height h. Take g =10m/s^2 (2)

c) A projectile has horizontal range S. If y_1 and y_2 are the greatest heights in the two paths possible, show that $S = 4(y_1 y_2)^{1/2}$. (3)

Q3a)The 50 kg crate as shown in fig 1 rests on a horizontal plane for which coefficient of kinetic friction is μ_k=0.3.If the crate is subjected to 400 N force as shown ,determine the velocity of crate in 3 seconds from rest. (5)

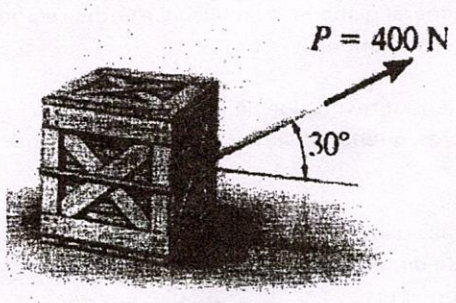

fig 1

b)The block has a mass of 50 kg and rests on the surface of the cart having a mass of 75 kg. If the spring which is attached to the cart and not the block is compressed 0.2 m and the system is released from rest, determine the speed of the block with respect to the cart after the spring becomes undeformed. Neglect the mass of the wheels and the spring in the calculation. Also neglect friction.

P.T.O.

Take k = 300N /m. (5)

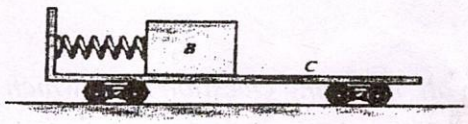

fig2

Q4a)A ball impinges directly on a similar ball at rest. The first ball is reduced to rest by the impact. Find the coefficient of restitution, if half of the initial kinetic energy is lost by impact. (5)

b)Derive the relation for Coriolis component of acceleration. (5)

Part-B

Q5a) The 30 kg uniform disc as shown in fig 3 is pin supported at its center. If it starts from rest, determine the number of revolutions it must make to attain an angular velocity of 20 rad/s. Also what are the reactions on the pin? The disc is acted upon by constant force F=10 N ,which is applied to the cord wrapped around its periphery ,and a constant couple moment M=5 N-m. Neglect the mass of the cord. (5)

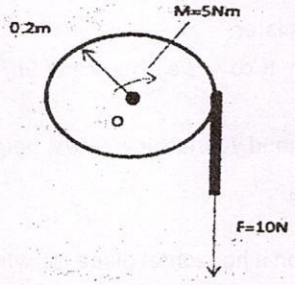

fig3

b)Derive the relation for kinetic energy of rigid body having angular velocity ω and its mass centre having velocity V_G subjected to general plane motion. Also write the relation for kinetic energy of a rigid body during A)Translation B)Rotation. (5)

Q6a)Derive the relation for coefficient of restitution in eccentric impact. (5)

b)Derive the relation for natural frequency of spring mass system considering the mass of the spring. (5)

Q7a)What are overdamped, critically damped and underdamped vibrations. (3)

b)State Eulers theorem for three dimensional kinematics of rigid body. (3)

c)Explain the terms: A)Product of inertia B)Euler angles (4)

x-x-x