

23

Exam.Code:0906
Sub. Code: 6669

1108
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. 1 which is compulsory and selecting two questions from each Part.

x-x-x

- Q1a) What is inertial frame of reference.
- b) Define potential function.
- c) State the principle of linear impulse and momentum.
- d) What is general plane motion.
- e) Differentiate between free and forced vibrations. (10)

Part-A

- Q2a) Derive the relation for radial and transverse components of acceleration. (5)
- b) A projectile has a horizontal range S . If y_1 and y_2 are the greatest heights in the two paths possible then show that $S = 4(y_1 y_2)^{1/2}$. (5)
- Q3a) Prove that escape velocity (V_e) of a satellite is equal to $(2GM_e/r_o)^{1/2}$ where G is gravitational constant, M_e is the mass of earth and r_o is the initial distance of satellite from center of the earth. (5)
- b) Packages having mass of 2 kg are delivered from a conveyor to a smooth circular ramp with the velocity of $V_o = 1$ m/s as shown in Fig1. If the radius of the ramp is 0.5, determine the angle $\theta = \theta_{max}$ at which the package begins to leave the surface using principle of work and energy. (5)

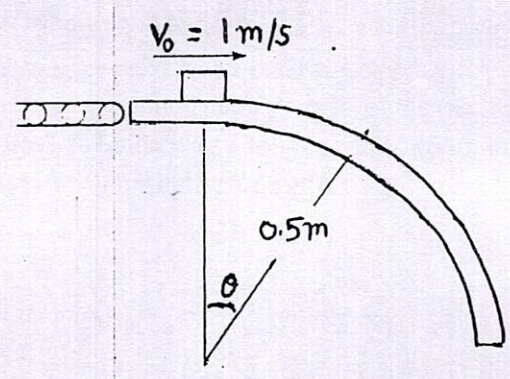


Fig1

- Q4a) Derive the relation for coefficient of restitution in central impact. (5)
- b) A flywheel 0.5 meter in diameter accelerates uniformly from rest to 360 rpm in 12 seconds.

P.T.O.

Determine the velocity and acceleration of a point on the rim of the flywheel one second after it has started from the rest.

Part-B

Q5a) The 30 kg uniform disc as shown in Fig 2 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 $F=10\text{ N}$, which is applied to the cord wrapped around its periphery, and a constant couple moment $M=5\text{ N}\cdot\text{m}$. Neglect the mass of the cord.

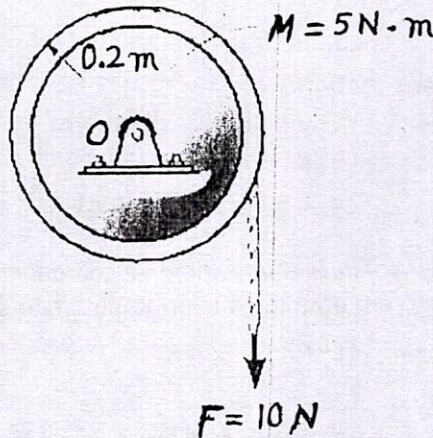


Fig 2

- b) Explain the principle of work and energy for a rigid body.
- c) What is an eccentric impact.

Q6a) Derive the relation for natural frequency of spring mass system considering the mass of the spring.

- b) Write the differential equation of viscous damped free vibration and find its solution.
- c) What are overdamped, critically damped and underdamped vibrations.

Q7a) State Euler's theorem for three dimensional kinematics of rigid body

- b) Show that finite rotations cannot be classified as vectors.
- c) Explain the terms:
 - A) Product of inertia
 - B) Gyroscopic motion

x-x-x

Time a

NOTE:

- I.
- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)
- i)
- j)

II a) W

b) Wh:

c) Wh:

III a) \

b) Dis

c) Def

d) Exp

ecosy:

IVa) \

b) Dis

c) Ho