Topic 2 – Kinematics

Past Paper Questions

Q1. A body is uniformly accelerated from 1.25 m/sec to 3.6 m/sec in 4 seconds. It then travels at this new velocity for 45 seconds and is then smoothly brought to rest at a deceleration of 0.52 m/sec^2.

Calculate

a. The acceleration (3M)
b. The time taken during deceleration (3M)
c. The total distance travelled from the start of acceleration (4M)

Q2. A 3m diameter flywheel increases its speed uniformly from 30 to 60 rpm in 10 seconds. Calculate

a. The angular acceleration (4M)
b. The number of revolutions turned through (4M)
c. The linear acceleration of a point on the rim of the flywheel (2M)

Q3. A body is projected vertically upwards with an initial velocity of 36 m/s. Take the gravitational acceleration as 9.81 m/s^2. Calculate

a. The height on its upward journey when its velocity will have reduced to 24 m/s (5M)
b. The time taken to reach this point (5M)

Q4. A flywheel is accelerated uniformly from 575 rpm to 925 rpm in 25 seconds. Calculate

a. The acceleration in rad/sec^2 (5M)
b. The number of revolutions turned during acceleration (4M)

Q5. A flywheel has a diameter of 1.3m and is rotating at an angular velocity of 5.6 rad/sec, for a point on the rim Calculate

a. The linear velocity (3M)
b. The rotational speed in revolutions per minute (3M)
c. The number of radians turned when the flywheel rotates through 315^0 (2M)
d. The equivalent linear distance moved when the flywheel rotates through 315^0 (2M)

Q6. A thin cord is wrapped around a 75mm diameter shaft with a mass attached to the end of the cord. The mass is released freom rest and falls through 2.1m in 3 seconds. Calculate

a. The angular velocity of the shaft after 3 seconds in rad/sec (5M)
b. The average angular acceleration in rad/sec^2 (5M)

Q7. A flywheel accelerates at a rate of 1.5 rad/sec^2 from initial speed of 35 rpm for a time of 25 seconds. Calculate

a. The final speed of the flywheel (6M)
b. The number of revolutions turned during this period of time (4M)

Q8. A wheel of diameter of 600mm has a linear velocity at the rim of 20m/s accelerates uniformly upto 30 m/s in 8 seconds. Determine

a. The linear distance travelled whilst accelerating (2M)
b. The angular acceleration (4M)
c. The number of revolutions turned during acceleration (4M)

Q9. A pulley is accelerated uniformly from rest at 8 rad/sec^2 for 20 seconds, it then runs at constant speed for 2 minutes before uniformly decelerating to rest in 40 seconds. Calculate

a. The angular velocity at the end of the acceleration (2M)
b. The deceleration (3M)
c. The number of revolutions turned (5M)

Q10. A vehicle is travelling at 36 km/hr. along a flat straight road, the diameter of the wheels are 500mm Calculate

a. i. the linear velocity at a point on the rim in m/s (2M)
   ii. the rotational speed of wheel in rev/min (4M)
b. the vehicle now accelerates at 52 km/hr. in 2.5 seconds Calculate
   i. the linear acceleration of the wheel at the rim (1M)
   ii. the angular acceleration of the wheel at the rim (3M)

Q11. A body initially at rest is uniformly accelerated for 55 seconds, during which it travels 1800m. It is then brought to rest in 20 seconds. Calculate

a. the maximum velocity attained (3M)
b. the value of deceleration (3M)
c. the total distance travelled (4M)