EXTRA

No of printed pages: 1

V.P.& R.P.T.P.Science College.Vallabh Vidyanagar.
Internal Test
B.Sc. Semester VI
US06CMTH06 (Mechanics-2)
Saturday , 11^{th} March 2017
11.00 a.m. to 12.30 p.m.

Maximum Marks: 25

Que.1 Fill in the blanks. 3

(1) Unit of angular momentum is .....
(a) $lb.ft^2./sec.$ (b) $lb.ft./sec.$ (c) $gm.ft^2./sec.$ (d) $lb.ft./sec^2.$

(2) Maximum height of projectile is .....
(a) $\frac{2v_0 \sin\alpha}{g}$ (b) $\frac{v_0 \sin\alpha}{g}$ (c) $\frac{v_0^2 \sin 2\alpha}{g}$ (d) $\frac{v_0^2 \sin^2\alpha}{2g}$

(3) The squares of the periodic times of the planets are proportional to the ..... of the semi major axis of their orbits .
(a) cube roots (b) cubes (c) squares (d) square roots

Que.2 Answer the following (Any three) 4

(1) Obtain equation of motion of a particle in cartesian form and polar form .

(2) Obtain equation of path of projectile in the form $y = x\tan\alpha\left(1 - \frac{x}{R}\right)$, where R is horizontal range .

(3) Find the law of force towards the pole for the curve described by the equation $r = ae^{\theta\cot\alpha}$.

Que.3 (a) State and prove principle of conservation of energy. 4
(b) Prove that the rate of change of kinetic energy is equal to the rate of change of workdone by the force . 2

OR

Que.3 (a) State and prove principle of angular momentum of a system relative to the mass center . 3
(b) Verify the principle of conservation of energy, if a particle slides down, on a smooth inclined plane starting from the rest. 3

Que.4 (a) A particle of mass m is projected in a vertical plane through the point of projection with velocity v_0 in the direction making an angle α with the horizontal axis .Show that the path of projectile is parabola. 4

(b) A particle just clear a wall of height 'b', at a distance 'a' and and strikes the ground at a distance 'c', from the point of projection. Prove that the angle of projection is given by, $\alpha = \tan^{-1}\left(\frac{bc}{ac - a^2}\right)$. 2

OR

Que.4 (a) Obtain the equation of motion of projectile with resistance in the form
$y = y_0 + u_y\, t - \frac{1}{2}\, g\, t^2 - \frac{1}{2}\, \phi\, u_y\, t^2\left(1 - \frac{gt}{3\, u_y}\right)$. 3

(b) A shell is fired vertically upward with the velocity v_0 . The resistance of air is $mgcv^2$ .Show that the maximum height attain by the shell is $h = \frac{1}{2gc} log(1 + cv_0^2)$. 3

Que.5 (a) If a particle moves in a central orbit under inverse square law then prove that its orbit is conic . 4

(b) Find moment of inertia of a rectangular plate of mass m and edges of lengths $2a$ and $2b$ about a line passes through the center of the plate and parallel to the edge $2b$. 2

OR

Que.5 (a) Obtain differential equation of orbit under central force . 3
(b) State and prove the theorem of *KÖNIG*. 3

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