2019

B.Sc. 1st Semester Examination

PHYSICS (General)

Paper - DSC 1A-T

(Mechanics)

Full Marks : 40 Time : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Answer any *five* questions : 5×2=10

   (a) Find a unit vertor in X-Y plane which is perpendicular to the vector $(3i+4j)$.

   (b) Construct a second order differential equation from $x(t) = a\cos w + b\sin wt$. What does it represent ?

   (c) Write down postulates of Einsteins special theory of Relativity.

   (d) Prove that angular momentum of a particualr moving under central force is a constant.

[Turn Over]

(e) Solve $\left(D^2-4\right)y=0,\ D=\frac{d}{dx}$.

(f) A mass (10 gm) is connected to one end of a spring (constant = 1000 dynes/cm) whose other end is connected to a rigid support. Find the frequency of oscillation of the mass.

(g) Prove that $D\leq\sigma\leq\frac{1}{2}$, where σ is the poisson's ratio.

(h) State and explain Keplar's laws.

2. Answer any *four* questions. 4×5=20

(a) Solve $\left(D^2-5D+6\right)y=e^{2x}+e^{3x}$

$\left(D^2-4\right)y=\sin 2x$ 3+2

(b) Find centre of mass of a uniform seim-circular disc of radius R. 5

(c) Prove that $Y=3k\left(1-2\sigma\right)$, the symbols have their usual meaning. 5

(d) Derive relativistie velocty addition formula. 5

(e) What is torsional Pendulum ? Derive the theory of determination of rigidity modulus using this pendulum. 1+4

(f) Write down equation of motion of a damped harmonic oscillator. Solve it. 5

3. Answer any *one* question. 1×10=10

(a) (i) Derive equation of motion of a rocket.

(ii) Find expression for work done in twisting a wire. 6+4

(b) (i) What is length contraction. Prove that $L = L_0\sqrt{1-v^2/c^2}$, the symbols have their usual meaning.

(ii) A Particle is found to move 600 meter in one microsecond. Find its speed. 6+4
