PC-1022/MJ

F-9/2051

MECHANICS–362
(Semester–VI)

Time : Three Hours] [Maximum Marks : 45

Note : Attempt *five* questions in all selecting *two* questions from each of the Sections A and B and compulsory question of Section C.

SECTION – A

(Attempt any *two* question)

I. Equal weights P and P are attached to two strings ACP and BCP passing over a smooth peg C. AB is heavy beam of weight W, where, C.G. is '*a*' meters from A and '*b*' meters from B. Show that AB is inclined to the horizontal at the angle

$$\tan^{-1}\left[\frac{a-b}{a+b}\tan\left(\sin^{-1}\frac{W}{2P}\right)\right].$$

II. Three forces P, Q and R act along three non-intersecting edges of a cube. Find the central axes.

III. Find the null point of the plane $x + y + z = 0$ for the force system (X, Y, Z, L, M, N).

IV. A body, consisting of a cone and a hemisphere on the same base rests on a rough horizontal table, the hemisphere being in contact with the table. Show that the greatest height of the cone, so that the equilibrium may be stable, is $\sqrt{3}$ times the radius of the hemisphere.

(2×6=12)

SECTION – B

(Attempt any *two* question)

V. Find expressions for acceleration along the tangent and normal of a particle moving along a plane curve.

VI. At the end of three successive seconds, the distance of a point moving with S.H.M. from its mean position measured in the same direction are 1, 5, 5. Show that the period of complete oscillation is $\frac{2\pi}{\theta}$ seconds where $\cos\ \theta = \frac{3}{5}$.

VII. Find the law of force towards the pole under which a particle describes the curve $r^2 = a^2 \cos 2\theta$.

VIII. A particle describes the path $r = a \tan \theta$ under a force to the origin. Find the acceleration and velocity in terms of r.

(2×6=12)

SECTION – C

(Compulsory Question)

IX. Attempt all questions.

(a) What are null lines, planes and points?

(b) What is the expression for kinetic energy?

(c) What is Simple Harmonic Motion?

(d) What is Hooke's Law of Motion?

(e) What are stable and unstable equilibriums?

(f) Define Angular momentum.

(g) What are the expressions of velocity and acceleration of a particle executes the S.H.M.? (7×3=21)