## SECTION 'B' (Short-Answer Questions) (40)

**NOTE:** Attempt any Ten part questions in all. All questions carry equal marks. (i.e. 4 marks of each part).

2. (i) The line joining the points A(2, -3) and B(-4, 5) is trisected. Find the coordinates of the points of trisection.

(ii) The line through (2, 5) and (-3, -2) is perpendicular to the line through (4, -1) and (x, 3). Find x

(iii) Find the equation of line through the intersection of the lines $2x - 3y + 4 = 0, 3x + 3y - 5 = 0$ and parallel to the y – axis.

(iv) Find the constant a such the vectors $2\hat{i} - \hat{j} + \hat{k}, \hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + a\hat{j} + 5\hat{k}$ are coplanar.

(v) A particle is acted on by constant forces $4\hat{i} + \hat{j} - 3\hat{k}$ and $3\hat{i} + \hat{j} - \hat{k}$ and is displaced from point $\hat{i} + 2\hat{j} + 3\hat{k}$ to the point $5\hat{i} + 4\hat{j} + \hat{k}$. Find the work done by the forces.

(vi) Find the equation of the circle having (-5, 6) and (3, -4) the end points of a diameter.

(vii) Prove that the curves $3x^2 - y^2 = 12$ and $x^2 + 3y^2 - 24 = 0$ intersect at right angle at the point $(\sqrt{6}, \sqrt{6})$

(viii) Find the equation of the parabola with focus (-5, 3) and directrix y = 7.

(ix) Find the equation of the ellipse whose vertices are at $(\pm 5, 0)$ and latus rectum of length 3.

(x) If $y = \sqrt{5}x + k$ is a tangent to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$, what is k?

(xi) Find the derivative by first principle at any point x in the domain D(f) of the following function $f(x) = 3x^3 - x$ or $f(x) = \tan x$

(xii) Using differentials, calculate the approximate value of cos 46° or sin 46°.

(xiii) Evaluate any Two of the following:

a) $\lim_{n\to 0} \frac{1-\cos\theta}{\theta^2}$ (b $\lim_{n\to\infty} \frac{\sqrt{x^2+1}}{x+1}$ (c) $\lim_{n\to a} \frac{x^m - a^m}{x^n - a^n}$ $m, n \in \mathbb{N}$

(xiv) Find $\frac{dy}{dx}$ of any Two of the following

a) $x^3 + y^3 + 3xy = 0$ (b) $\sin(x + y) = \ln(x - y)$

(c) $x = \ln t + \sin t, y = e^t + \cos t$

(xv) Evaluate any Two of the following:

(a) $\int \frac{\sec x \tan x}{a + b\sec x} dx$ (b) $\int \sin^2\theta \cos^2\theta d\theta$ (c) $\int 3x\sqrt{1 - 2x^2} dx$

(xv) OR (a) Solve the differential equation $\frac{dy}{dx} = \text{cosec} 2y \cos x$

(xv) OR (b) Find the area above x – axis, under the curve $y = x - 5x^{-2}$, between the coordinates $y = 2$ and $x = 4$.

## SECTION "C" (Detailed Answer Questions)(20)

**NOTE:** Attempt any TWO question from this section.
All questions carry equal marks.

3. a) Find the equation of the straight line which passes through the point (-3, 2) and is such that the portion of it between the axes is divided by the point in the ratio 1: 2.

b) Evaluate any Two of the following:

i) $\int_{-1}^{1} (2x^2 + 4)^2 (4x) dx$ (ii) $\int e^{3\cos 2x} \sin 2x dx$

(iii) $\int \ln x \, dx$

4. a) Prove that the straight lines $bx - dy = abm$ and $bx + ay = \frac{ab}{m}$ always meet on the hyperbola.

b) The coordinates of two points A and B are (3, 4) and (5, -2) respectively. Find the coordinates of any point P if $|\overline{PA}| = |\overline{PB}|$ and the area of triangle PAB is 10 square units.

---OR-Find the coordinates of the foot of the perpendicular form $(-2, 5)$ to $3x + y + 11 = 0$.

5. a) Find the extreme values of the function f: $\mathbb{R} \to \mathbb{R}$, $f(x) = e^x \sin x$ or $f(x) = x^3 - 9x^2 + 15x + 3$

(b) Evaluate any Two of the following:

i) $\int \sin^2 x \cos^2 x dx$ (ii) $\int \frac{\sqrt{x^2 - a^2}}{x} dx$ (iii) $\int \frac{\cos x}{\sin x(2 + \sin x)} dx$