

4. Write short answers to any NINE questions:

(2 x 9 = 18)

- i- What is feasible region?
- ii- Derive equation of circle in standard form.
- iii- Write an equation of circle with centre $(-3, 5)$ and radius 7.
- iv- Check the position of point $(5, 6)$ with respect to circle: $2x^2 + 2y^2 + 12x - 8y + 1 = 0$
- v- Find equation of hyperbola with foci $(0, \pm 9)$, directrices $y = \pm 4$.
- vi- Find the focus and directrix of the parabola if $x^2 = 5y$.
- vii- Find an equation of ellipse with foci $(\pm 3, 0)$ and minor axis length 10.
- viii- Indicate the solution set of system of linear inequality by shading $4x - 3y \leq 12$; $x \geq -\frac{3}{2}$
- ix- Define equal vector, give an example.
- x- Find the magnitude and direction cosines of $\underline{v} = 4\underline{i} - 5\underline{j}$
- xi- Find scalar " α " so that the vectors $2\underline{i} + \alpha\underline{j} + 5\underline{k}$ and $3\underline{i} + \underline{j} + \alpha\underline{k}$ are perpendicular.
- xii- Which vectors, if any, are parallel or perpendicular
 $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{v} = -\underline{i} + \underline{j} + \underline{k}$, $\underline{w} = \frac{\pi}{2}\underline{i} - \pi\underline{j} + \frac{\pi}{2}\underline{k}$
- xiii- Prove that the vectors $\underline{i} - 2\underline{j} + 3\underline{k}$, $-2\underline{i} + 3\underline{j} - 4\underline{k}$ and $\underline{i} - 3\underline{j} + 5\underline{k}$ are coplanar.

SECTION II

- 5- (a) Evaluate $\lim_{\theta \rightarrow 0} \frac{\tan \theta - \sin \theta}{\sin^3 \theta}$ 5
- (b) If $\tan y(1 + \tan x) = 1 - \tan x$, show that $\frac{dy}{dx} = -1$ 5
- 6- (a) If $x = \sin \theta$, $y = \sin m\theta$, show that $(1 - x^2)y_2 - xy_1 + m^2y = 0$ 5
- (b) Evaluate $\int \frac{\sqrt{2}}{\sin x + \cos x} dx$ 5
- 7- (a) Evaluate $\int_0^{\frac{\pi}{4}} \frac{1}{1 + \sin x} dx$ 5
- (b) Maximize $f(x, y) = 2x + 5y$, subject to the constraints $2y - x \leq 8$; $x - y \leq 4$; $x \geq 0$; $y \geq 0$ 5
- 8- (a) Find the length of the chord cut off from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$ 5
- (b) Prove that in any $\triangle ABC$, $b^2 = c^2 + a^2 - 2ca \cos B$ 5
- 9- (a) Find the interior angles of a triangle with vertices $A(-2, 11)$, $B(-6, -3)$ and $C(4, -9)$ 5
- (b) Find the centre, foci, eccentricity, vertices and directrices of the Ellipse $x^2 + 4y^2 = 16$ 5