



SECTION A (Multiple Choice Questions)

Time: 30 minutes

NOTE: This section consists of 25 part questions and all are to be answered.
Each part question carries TWO marks.

Q.1. Select the correct answer from the given options.

Marks: 50

- i. $[a, \infty)$ is used for the set.
a) $\{x \in \mathbb{R} | x > a\}$ b) $\{x \in \mathbb{R} | x \geq a\}$ c) $\{x \in \mathbb{R} | x < a\}$ d) $\{x \in \mathbb{R} | x \leq a\}$
- ii. The implication symbol " \Rightarrow " is read as.
a) tends to b) implies that c) approaches to d) None of these
- iii. $(-\infty, a)$ is represented by a ray consisting of all points of \mathbb{R} on the,
a) left of a b) right of a c) upward d) downward
- iv. The distance between any two points on the axis of x is the absolute value of the difference of their _____.
a) Zeros b) Ordinates c) Abscissa d) None of these
- v. The distance between the two parallel lines $5x - 12y + 10 = 0$ and $5x - 12y - 16 = 0$ is _____ units.
a) 1 b) 3 c) 5 d) 2
- vi. The equation of the straight line that passes through the point $(4, \sqrt{3})$ and makes an angle of $\pi/6$ radians with axis of x will be _____.
a) $x + \sqrt{3}y + 1 = 0$ b) $x - \sqrt{3}y + 1 = 0$ c) $x + \sqrt{3}y - 1 = 0$ d) $x - \sqrt{3}y - 1 = 0$
- vii. $ax + by + c = 0$, if $a \neq 0$, $b \neq 0$, $c = 0$ then line passes through _____.
a) x-axis b) origin c) y-axis d) None of these
- viii. Language used _____ for derivative of y with respect to x.
a) $f(x)$ b) $f'(x)$ c) $Df(x)$ d) $\frac{dy}{dx}$
- ix. $\int \sec^2 x \cdot \tan x \, dx =$ _____.
a) $-\sec x + c$ b) $2 \sec x + c$ c) $\frac{1}{2} \sec^2 x + c$ d) $\tan^2 x + c$
- x. $x^2 + y^2 = r^2$ is the equation of the circle with centre _____.
a) (1,1) b) (0,1) c) (0,0) d) (1,0)
- xi. If the intersecting plane which is parallel to a generator of the cone, intersects it's both nappes but does not pass through it's vertex, then the curve of their intersection is called _____.
a) a circle b) a parabola c) a hyperbola d) an ellipse
- xii. The unit vector in the direction of a vector $\vec{a} = (3, -2, 7)$.
a) $\frac{3i-2j+7k}{\sqrt{62}}$ b) $\frac{3i-2j+2k}{\sqrt{54}}$ c) $\frac{3i-2j+2k}{62}$ d) 1
- xiii. The coordinates of a point on z-axis in three axes are _____.
a) (x, 0, 0) b) (o, y, 0) c) (0, 0, z) d) (0, 0, 0)
- xiv. The point on the parabola which is closest to the focus is _____.
a) vertex b) directrix c) focus d) origin
- xv. The set of all points in a plane which are equidistant from a fixed point and a fixed line is called:
a) circle b) parabola c) ellipse d) hyperbola
- xvi. $\frac{d}{dx}(\cos x) =$ _____.
a) $\cos x$ b) $-\cos x$ c) $\sec x$ d) $-\sin x$

- xvii. An _____ is a set of all the points or real numbers between two points.
 a) bound b) interval c) limit d) Function
- xviii. $(8, \pi/3)$ are called the _____ coordinates.
 a) Polar b) Triangular c) Spherical d) Cartesian
- xix. The distance between the points $(-1, 4)$ and $(3, -2)$ is _____ units.
 a) 26 b) $\sqrt{26}$ c) $2\sqrt{13}$ d) $\sqrt{13}$
- xx. The area of a triangle with vertices $(-a, b + c)$, $(a, b - c)$ and $(a, -c)$ is _____ sq. units.
 a) a b) b c) ab d) a/b
- xxi. $ax + by + c = 0$ if $b = 0$ then equation of line is parallel to _____.
 a) y-axis b) x-axis c) z-axis d) None of these
- xxii. Equation of circle with centre at origin and radius r is _____.
 a) $x^2 - y^2 = r^2$ b) $x^2 + y^2 = r^2$ c) $x + y = r$ d) $x - y = r$
- xxiii. If $\vec{a} \cdot \vec{b} = 0$ then the angle between the vectors \vec{a} and \vec{b} is _____.
 a) 0 b) $\frac{\pi}{2}$ c) $\frac{\pi}{3}$ d) π
- xxiv. The theory of _____ plays an important role in modern space mechanics, ocean graphy and many other branches of science and technology.
 a) lines b) planes c) pascal d) conics
- xv. Radius of the circle $x^2 + y^2 + 12x - 10y = 0$ is
 a) $\sqrt{61}$ b) 61 c) 62 d) 64

TIME: One and Half hours

Marks: 50

SECTION B (30 Marks) (Short -Answer Questions)

Note : Answer any six part questions from this section. Selecting two part questions from each question.

Analytical Geometry and Vector Algebra

- Q2**
- Find the equation of the lines which is perpendicular to $2x + 3y + 4 = 0$ and passes through $(2, -1)$.
 - Find the slope of the line through the midpoint of the segment from A $(-4, 4)$ to B $(2, 2)$ and the point which is three fifth the way from C $(5, 3)$ to D $(-3, -2)$.
 - For what value of k will the three lines $2x - 3y - 7 = 0$, $4x - 3y - 11 = 0$ and $2x + ky + 1 = 0$ be concurrent?
 - Resolve the vector $\vec{a} = (6, 8, -6)$ in the direction of vectors $\vec{p}_1 = (1, -1, 2)$, $\vec{p}_2 = (2, 2, -1)$ and $\vec{p}_3 = (3, 7, -7)$.

Conic Sections

- Q3 (i)** Find the equation of the circle concentric with the circle $x^2 + y^2 + 6x - 10y + 33 = 0$ and touching the lines $y = 0$
- Find the equation of the circle containing the points $(-1, -1)$ and $(3, 1)$ and with the centre on the line $x - y + 10 = 0$
 - Find the equations of the tangents at the ends of the Latus rectum of the parabola $x^2 = 4ay$.
 - If $y = \sqrt{5}x + k$ is a tangent to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$, what is k ?

Calculus

Q4 (i) Evaluate any two (2) of the following:

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}, \quad \lim_{x \rightarrow \infty} \frac{x^2 - 5x + 2}{5x^2 + 6x - 4}, \quad \lim_{x \rightarrow 0} \frac{\tan x - \sin x}{5m^2 x}$$

ii. Find the derivative using first principle:

$$f(x) = \sin 2x \quad \text{OR} \quad f(x) = x^{2/3}$$

iii. Find $\frac{dy}{dx}$ any two (2) of the following:

a) $e^x \ln y - \sin^{-1} y$

b) $y = \ln \left(\frac{1-x^2}{1+x^2} \right)$

c) $\sqrt{x^2 + y^2} = \ln(x^2 - y^2)$

iv. Find of any two of the following:

a) $x^3 + y^3 = 3x^2y$

b) $e^x \ln y - \tan^{-1} y = x$

c) $x = a \cos^2 \theta, y = b \sin^2 \theta$

SECTION C (Detailed -Answer Questions) (20 Marks)

Note: Attempt any two (02) questions from this section:

Q.5. Evaluate any two :

i) $\int (x^3 + 1)^{7/3} x^5 dx$

ii) $\int_{-9}^{-3} \frac{\sqrt{x^2-9}}{x} dx$

iii) $\int \tan^{-1} x dx$

iv) $\int_0^2 \frac{y^3 dy}{\sqrt{16-y^2}}$

Q6. (i) The coordinates of two points A and B are (3,4) and (5,-2) respectively find the coordinates of point P. If $|PA| = |PB|$ and the area of triangle PAB=10 square units.

ii) Show that the eccentricities e_1 and e_2 of the two conjugate Hyperbolas satisfy the relation $e_1^2 + e_2^2 = e_1^2 e_2^2$.

Q7. (i) Find the relative maximum and relative minimum values of the function.

$$f(x) = e^x \sin x \quad \text{OR} \quad f(x) = \frac{\ln x}{x}$$

ii) Evaluate:

$$\int \frac{\sec x \tan x}{\cot x \cos x} dx \quad \text{OR} \quad \int \frac{x^2 \tan^{-1} x}{\ln(\cos x)} dx$$