RWP-1-24

☆☆☆ Roll No ______ to be filled in by the candidate

HSSC-(P-II)- A-2024

(For All Sessions)

(GROUP-I)

Paper Code	8	1	9	5

Mathematics (Objective)

Time: 30 Minutes   Marks : 20

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1	Midpoint of $A(2,0), B(0,2)$ is:	(A)	$(0,2)$	(B)	$(2,0)$	(C)	$(2,2)$	(D)	$(1,1)$
2.	The ___ point satisfies $x + 2y < 6$	(A)	$(4,1)$	(B)	$(3,1)$	(C)	$(1,3)$	(D)	$(1,4)$
3.	In a conic, the ratio of the distance from a fixed point to the distance from a fixed line is:	(A)	Focus	(B)	Vertex	(C)	Ecentricity	(D)	Centre
4.	Standard equation of Parabola is:	(A)	$y^2 = 4ax$	(B)	$x^2 + y^2 = a^2$	(C)	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	(D)	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
5.	Equation of tangent to circle $x^2 + y^2 = a^2$ at $P(x_1, y_1)$ is:	(A)	$xx_1 + yy_1 = a^2$	(B)	$xx_1 - yy_1 = a^2$	(C)	$xy_1 + yx_1 = a^2$	(D)	$xy_1 - yx_1 = a^2$
6.	The volume of parallelopiped =____.	(A)	$(\underline{u} \times \underline{v}).\underline{\omega}$	(B)	$(\underline{u} \times \underline{v}) \times \underline{\omega}$	(C)	$\underline{u} \times (\underline{v} \times \underline{\omega})$	(D)	$\underline{u} \times (\underline{u} \times \underline{v})$
7.	The non-zero vectors are perpendicular when:	(A)	$\underline{u}.\underline{v} = 1$	(B)	$\lvert\underline{u}.\underline{v}\rvert = 1$	(C)	$\underline{u}.\underline{v} = 0$	(D)	$\underline{u}.\underline{v} \neq 0$
8.	$\underline{j} \times \underline{k} =$ ______.	(A)	$\underline{i}$	(B)	$-\underline{i}$	(C)	0	(D)	$\underline{k}$
9.	The range of $f(x) = 2 + \sqrt{x-1}$ is:	(A)	$[1, +\infty)$	(B)	$[2, +\infty)$	(C)	$(1, +\infty)$	(D)	$(2, +\infty)$
10.	The perimeter P of square as a function of its area A:	(A)	$3\sqrt{A}$	(B)	$4\sqrt{A}$	(C)	$\sqrt{A}$	(D)	$2\sqrt{A}$
11.	If $f(x) = \frac{1}{x^2}$ then $f'(3) =$______.	(A)	$\frac{1}{9}$	(B)	$\frac{-2}{3}$	(C)	$\frac{-2}{27}$	(D)	$\frac{1}{27}$
12.	If $f'(c) = 0$ & $f''(c) > 0$ then C is point of:	(A)	Maxima	(B)	Minima	(C)	Inflection	(D)	Constant
13.	$\frac{d}{dx}(\log_a x) =$ _____.	(A)	$\frac{1}{x\ln a}$	(B)	$\frac{\ln a}{x}$	(C)	$\frac{1}{x}$	(D)	$\frac{-1}{x\ln a}$
14.	$\frac{d}{dx}(\cot ax) =$ _____.	(A)	$cosec^2 ax$	(B)	$a\, cosec^2 ax$	(C)	$-a\, cosec^2 ax$	(D)	$-a\, cosec\, ax$
15.	$\int \frac{1}{\sqrt{1-x^2}}\, dx =$ _____.	(A)	$Sin^{-1}x + c$	(B)	$Cos^{-1}x + c$	(C)	$-Sin^{-1}x + c$	(D)	$-Cos^{-1}x + c$
16.	$\int \frac{1}{x}\, dx =$ _____.	(A)	$\ln x + c$	(B)	$\frac{1}{x^2} + c$	(C)	$-\frac{1}{x^2} + c$	(D)	$\frac{1}{x} + c$
17.	The solution of differential equation $\frac{dy}{dx} = -y$ is:	(A)	$y = xe^{-x}$	(B)	$y = ce^{-x}$	(C)	$y = e^x$	(D)	$y = ce^x$
18.	$\int_0^1 \frac{1}{1+x^2}\, dx =$ ______.	(A)	$\frac{\pi}{4}$	(B)	$\frac{2\pi}{3}$	(C)	$\frac{3\pi}{4}$	(D)	π
19.	x – intercept of the line $2x + 5y - 1 = 0$ is:	(A)	2	(B)	3	(C)	$\frac{1}{2}$	(D)	$\frac{1}{5}$
20.	Slope of $y - axis$ is:	(A)	0	(B)	1	(C)	-1	(D)	$Undefined$

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Mathematics (Subjective)

HSSC-(P-II)-A/2024
(For All Sessions)
(GROUP-I)

Marks : 80

Time: 2:30 hours

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)

i. If $f(x) = 2x + 1$, then find $fof\ (x)$.

ii. Express the area A of a circle as a function of its circumference C.

iii. Evaluate $\lim_{h\to 0}\frac{\sqrt{x+h}-\sqrt{x}}{h}$

iv. Define continuous function.

v. Differentiate $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2\ w.r.t\ x$

vi. Find $\frac{dy}{dx}$ if $y^2 - xy - x^2 + 4 = 0$

vii. Differentiate $x^2 sec4x w.r.t\ x$

viii. Differentiate $sin^2 x w.r.t.\ cos^4 x$

ix. Find $f'(x)$ if $f\ (x) = e^x(1 + lnx)$

x. Find y_2 if $y = ln(x^2 - 9)$

xi. Prove that $ln(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots$

xii. Determine the interval in which $f(x) = cosx$ is decreasing; $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$.

3. Write short answers of any eight parts from the following: (8x2=16)

i. Solve the differential equation $sec^2 x\ tan\ y\ dx + sec^2 y \tan x\ \ dy = 0$

ii. Find the area between $x - axis$ and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$

iii. Evaluate: $\int_1^e x\ lnx\ dx$

iv. Evaluate the integral $\int \frac{-2x}{\sqrt{4-x^2}} dx$

v. Evaluate: $\int \left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2 dx$

vi. Evaluate the integral $\int (a - 2x)^{3/2}\ dx$

vii. Find the approximate change in the volume of a cube if length of its each edge changes from 5 to 5.02.

viii. Show that the points $A(0, 2), B(\sqrt{3}, -1)$ and $C(0, -2)$ are vertices of a right triangle.

ix. Convert the equation of line $4x + 7y - 2 = 0$ into normal form.

x. Fine the angle from the line with slope $\frac{-7}{3}$ to the line with slope $\frac{5}{2}$.

xi. Find the pair of lines represented by $3x^2 + 7xy + 2y^2 = 0$.

xii. Find the point of intersection of lines $3x + y + 12 = 0$ and $x + 2y - 1 = 0$.

4. Write short answers of any nine parts from the following: (9x2=18)

i. Define feasible region.

ii. Graph the solution set of in-equality $3x + 7y \geq 21$.

iii. Find equation of circle with ends of diameter at $(-3, 2)$ and $(5, -6)$.

iv. Write down equation of tangent to the circle $x^2 + y^2 = 25$ at $(5\ cos\theta\ , 5\ sin\theta)$

v. Find focus and vertex of Parabola $x^2 = 4(y - 1)$

vi. Find equation of ellipse with data Foci $(\pm 3, 0)$ Minor axis of length 10.

vii. Find center of hyperbola $x^2 - y^2 + 8x - 2y - 10 = 0$

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viii. Find equation of Normal to $y^2 = 4ax$ at $(at^2, 2at)$.

ix. Find the sum of vector $\overrightarrow{AB}$ and $\overrightarrow{CD}$ given four points $A(1,-1)B(2,0)C(-1,3)$ and $D(-2,2)$

x. Find $\propto$, so that $|\propto \underline{i} + (\propto +1)\underline{j} + 2\underline{k}|=3$

xii. If $\underline{v}$ is a vector for which $\underline{v}.\underline{i} = 0\underline{v}.\underline{j} = 0\underline{v}.\underline{k} = 0$, find $\underline{v}$

xii. Find the area of triangle determined by the points $P(0,0,0)$ $Q(2,3,2)$ and $R(-1,1,4)$

xiii. Find the value of $2\hat{\imath} \times 2\hat{\jmath}.\hat{k}$

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Find the values of m and n, so that given function f is continuous at $x = 3$ when
$$f(x) = \begin{cases} mx, & if\ x < 3 \\ n, & if\ x = 3 \\ -2x+9, & if\ x > 3 \end{cases}$$ (05)

(b) Find $\frac{dy}{dx}$, when $x = \frac{a(1-t^2)}{1+t^2}, y = \frac{2bt}{1+t^2}$ (05)

6. (a) If $y = (cos^{-1}x)^2$, prove that $(1-x^2)y_2 - xy_1 - 2 = 0$. (05)

(b) Evaluate the integral $\int e^x sinx\ cosx\ dx$. (05)

7. (a) Solve the differential equation $y - x\frac{dy}{dx} = 3\left(1 + x\frac{dy}{dx}\right)$. (05)

(b) Graph the feasible region and corner points of the inequalities (05)

$$2x + y \le 10; \quad x + 4y \le 12; x + 2y \le 10;$$

8. (a) Show that the circles: $x^2 + y^2 + 2x - 8 = 0$; $x^2 + y^2 - 6x + 6y - 46 = 0$ touch internally. (05)

(b) Using vector method, for any triangle ABC, prove that: $c^2 = a^2 + b^2 - 2ab\ cosC$. (05)

9. (a) Find the focus, vertex and directrix of the Parabola; $x^2 = 4(y-1)$ (05)

(b) Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$ and also find measure of the angle between them. (05)

RWP-2-24

☆☆	Roll No 156172

HSSC-(P-II)- A-2024
(For All Sessions)

Paper Code	8	1	9	4

Mathematics (Objective)

(GROUP-II)

Time: 30 Minutes **Marks : 20**

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

		(A)	(B)	(C)	(D)
1.1	If $r = 0$, the circle is called:	Unit circle	Circle	Ellipse	Point circle
2.	$[\underline{i}\ \ \underline{i}\ \ \underline{k}] =$	$\underline{i}$	$-\underline{i}$	1	0
3.	If $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}, \underline{v} = 4\underline{i} + 2\underline{j} - \underline{k}$ then $\underline{u} \times \underline{u} =$	u^2	0	1	2
4.	If $\underline{u}, \underline{v}$ are two non-zero vectors, then area of parallelogram =	$\lvert\underline{u} \times \underline{v}\rvert$	$\frac{1}{2}\lvert\underline{u} \times \underline{v}\rvert$	$\frac{1}{6}\lvert\underline{u} \times \underline{v}\rvert$	$\frac{1}{2}(\underline{u} \times \underline{v})$
5.	If k is any real number, $\lim_{x \to a}[kf(x)] =$	$\lim_{x \to a} f(x)$	$\lim_{x \to a} k$	$k \lim_{x \to a} f(x)$	$f(x)$
6.	If $(fx) = x + 3$ then: $lim_{x \to 3} f(x) =$	6	0	-3	3
7.	If $y = e^{f(x)}$ then $\frac{dy}{dx} =$	$e^{f(x)}$	$f(x)e^{f(x)}$	$f(x)e^{f(x)}$	$f'(x)e^{f(x)}$
8.	Derivative of $x\sqrt{x^2+3}$ $w.r.t\ x$ is:	$\frac{2x^2+3}{\sqrt{x^2+3}}$	$\frac{3x}{2\sqrt{x^2+3}}$	$\frac{3x^2+3}{x\sqrt{x^2+3}}$	$\frac{3x^2+3}{2x\sqrt{x^2+3}}$
9	Derivative of $\tanh(x^2)$ is:	$2x\ sech^2 x$	$2\ sech^2 x^2$	$2x\ sech^2 x^2$	$sech^2 x^2$
10.	Derivative of "x" $w.r.t$ "x" is:	x^2	2	0	1
11.	In integration, substitution of $\sqrt{4 - x^2}$ is:	$x = sin\theta$	$x = 2\ sin\theta$	$x = sin2\theta$	$x = 2\ cos\theta$
12.	$\int Tan\,x\,dx =$	$ln\cos x + c$	$\frac{1}{ln\cos x} + c$	$-ln\lvert\cos x\rvert + c$	$Sec^2 x + c$
13.	Solution of differential equation: $(e^x + e^{-x})\frac{dy}{dx} = e^x - e^{-x}$ is:	$-ln(e^x + e^{-x}) + c$	$ln(e^x - e^{-x}) + c$	$ln(e^x + e^{-x}) + c$	$\frac{(e^x + e^{-x})^2}{2}$
14.	$\int Sinx Cos\,x\,dx =$	$\frac{Sin^2 x}{2} + c$	$\frac{Cos^2 x}{2} + c$	$-Sin\,x + c$	$Cosx + c$
15.	The line: $ay + b = 0$ is	Parallel to y-axis	Parallel to x-axis	Passing through origin	Lies in Quad. I
16.	The slope of line joining the points $(-2, 4)$; $(5, 11)$ is:	1	-1	45°	$-45°$
17.	The location of the plane of the point P(x, y) for which y = 0 at:	Origin	$y - axis$	$x - axis$	Ist Quad
18.	The maximum and minimum values occur at:	Corner point	Any point	Convex region	Corner points of feasible region
19.	The line intersect the circle at:	One point	Two points	Infinite points	More than two points
20.	Diameter of circle: $x^2 + y^2 = 16$ is:	8	4	16	32

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HSSC-(P-II)-A/2024

(For All Sessions)

Marks : 80

Time: 2:30 hours

Mathematics (Subjective)

(GROUP-II)

SECTION-I

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2. **Write short answers of any eight parts from the following:** (8x2=16)

i. Define even function with example.

ii. Find $fog(x)$ if $f(x) = 2x + 1, g(x) = \frac{3}{x-1}, x \neq 1.$

iii. Evaluate: $\lim_{x \to 2} \frac{\sqrt{x}-\sqrt{2}}{x-2}.$

iv. Prove that $Sinh2x = 2\,Sinhx\,Coshx.$

v. Find $\frac{dy}{dx}$ from first principles if $y = \frac{1}{\sqrt{x+a}}.$

vi. Differentiate $w.r.t\ x$; $\frac{(x^2+1)^2}{x^2-1}.$

vii. Find $\frac{dy}{dx}$ if $x^2 - 4xy - 5y = 0.$

viii. Differentiate w.r.t θ; $tan^3\theta\ sec^2\theta.$

ix. Find $f'(x)$ if $f(x) = x^3 e^{1/x}.$

x. Find y_2 if $y = 2x^5 - 3x^4 + 4x^3 + x - 2.$

xi. Apply Maclaurin Series expansion to prove that: $cosx = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots$

xii. Find extreme values for $f(x) = 3x^2.$

3. **Write short answers of any eight parts from the following:** (8x2=16)

i. Evaluate $\int x\sqrt{x^2-1}\,dx$

ii. Use differentials to approximate the value of $(31)^{\frac{1}{5}}$

iii. Evaluate: $\int \frac{x}{\sqrt{4+x^2}}dx$

iv. Evaluate the integral $\int \frac{e^{m\,tan^{-1}x}}{1+x^2}dx$

v. Evaluate: $\int_1^2 \frac{x}{x^2+2}dx$

vi. Find the area between $x-axis$ and the curve $y = 4x - x^2$

vii. Solve the differential equation $\frac{1}{x}\frac{dy}{dx} = \frac{1}{2}(1+y^2)$

viii. The points $A(-5,-2)$ and $B(5,-4)$ are ends of a diameter of a circle. Find the centre and radius of circle.

ix. The coordinates of a point p are $(-6, 9)$. The axes are translated through the point $O'(-3, 2)$. Find the coordinates of p referred to the new axes.

x. Check whether the origin and the point $p(5,-8)$ lies on the same side or on the opposite sides of the line $3x + 7y + 15 = 0$

xi. By means of slopes, show that the following points lie on the same line $(-4, 6)$; $(3, 8)$; $(10, 10)$.

xii. Determine the value of p such that the lines $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

4. **Write short answers of any nine parts from the following:** (9x2=18)

i. Graph the solution set of $3y - 4 \leq 0$ in $xy-$plane.

ii. Define convex region.

iii. Find an equation of circle of radius a and lying in the second quadrant tangent to both the axes.

iv. Find center and radius of circle $5x^2 + 5y^2 + 24x + 36y + 10 = 0.$

v. Write down equation of normal to the circle $x^2 + y^2 = 25$ at $(4, 3)$.

vi. Find vertex and directrix of the parabola $y^2 = -12x.$

vii. Find the point of intersection of conics $x^2 + y^2 = 8$ and $x^2 - y^2 = 1.$

viii. Find center and foci of hyperbola $\frac{y^2}{4} - x^2 = 1.$

ix. Find a vector of magnitude 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}.$

x. Find direction cosines of $\overrightarrow{PQ}$ where $P = (2, 1, 5)$ and $Q = (1, 3, 1).$

xi. Find volume of parallelopiped whose edges are $\underline{u} = \underline{i} - 2\underline{j} + 3\underline{k}$, $\underline{v} = 2\underline{i} - \underline{j} - \underline{k}$ and $\underline{w} = \underline{j} + \underline{k}$

xii. Find the value of $[\underline{k}\ \ \underline{i}\ \ \underline{j}]$.

xiii. Find $\propto$ so that $\underline{u} = \propto \underline{i} + 2\propto \underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \propto \underline{j} + 3\underline{k}$ are perpendicular.

SECTION-II

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Note Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Evaluate: $\lim_{\theta \to o} \frac{tan\theta - sin\theta}{sin^3\theta}$ (b) Differentiate $cos\sqrt{x}$ from the first principle. (5+5)

6. (a) Show that $y = \frac{\ln x}{x}$ has maximum value at $x = e$ (b) Evaluate: $\int x^3 \cos x \, dx$ (5+5)

7. (a) Evaluate: $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \frac{cosx\, dx}{sinx\,(2 + sinx)} dx$ (b) Minimize $z = 2x + y$ subject to constraints (5+5)

$x + y \geq 3 \quad 7x + 5y \leq 35$

$x \geq 0 \quad y \geq 0$

8. (a) Find the coordinates of the points of intersection of the line $x + 2y = 6$ with the circle: $x^2 + y^2 - 2x - 2y - 39 = 0$ (5)

(b) If $\underline{a} = 4\underline{i} + 3\underline{j} + \underline{k}$ and $\underline{b} = 2\underline{i} - \underline{j} + 2\underline{k}$. Find a unit vector perpendicular to both $\underline{a}$ and $\underline{b}$. Also find the sine of the angle between them. (5)

9. (a) Find the focus, vertex and directrix of the Parabola $x + 8 - y^2 + 2y = 0$ (5)

(b) Find coordinates of the circumcenter of the triangle whose vertices are $A(-2,3)$, $B(-4,1)$ and $C(3,5)$. (5)

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