RWP-2-24

☆☆	Roll No 756172

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.

1.1	If $r = 0$, the circle is called:	(A)	Unit circle	(B)	Circle	(C)	Ellipse	(D)	Point circle
2.	$[\underline{i}\ \ \underline{i}\ \ \underline{k}] =$	(A)	$\underline{i}$	(B)	$-\underline{i}$	(C)	1	(D)	0
3.	If $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}, \underline{v} = 4\underline{i} + 2\underline{j} - \underline{k}$ then $\underline{u} \times \underline{u} =$	(A)	u^2	(B)	0	(C)	1	(D)	2
4.	If $\underline{u}, \underline{v}$ are two non-zero vectors, then area of parallelogram =	(A)	$\lvert\underline{u} \times \underline{v}\rvert$	(B)	$\frac{1}{2}\lvert\underline{u} \times \underline{v}\rvert$	(C)	$\frac{1}{6}\lvert\underline{u} \times \underline{v}\rvert$	(D)	$\frac{1}{2}(\underline{u} \times \underline{v})$
5.	If k is any real number, $\lim_{x\to a}[kf(x)] =$	(A)	$\lim_{x\to a} f(x)$	(B)	$\lim_{x\to a} k$	(C)	$k \lim_{x\to a} f(x)$	(D)	$f(x)$
6.	If $(fx) = x + 3$ then: $lim_{x\to 3} f(x) =$	(A)	6	(B)	0	(C)	-3	(D)	3
7.	If $y = e^{f(x)}$ then $\frac{dy}{dx} =$	(A)	$e^{f(x)}$	(B)	$f(x)e^{f(x)}$	(C)	$f(x)e^{f(x)}$	(D)	$\dot{f}(x)e^{f(x)}$
8.	Derivative of $x\sqrt{x^2+3}$ $w.r.t$ x is:	(A)	$\frac{2x^2+3}{\sqrt{x^2+3}}$	(B)	$\frac{3x}{2\sqrt{x^2+3}}$	(C)	$\frac{3x^2+3}{x\sqrt{x^2+3}}$	(D)	$\frac{3x^2+3}{2x\sqrt{x^2+3}}$
9	Derivative of $\tanh(x^2)$ is:	(A)	$2x\ sech^2x$	(B)	$2\ sech^2x^2$	(C)	$2x\ sech^2x^2$	(D)	$sech^2x^2$
10.	Derivative of "x" $w.r.t$ "x" is:	(A)	x^2	(B)	2	(C)	0	(D)	1
11.	In integration, substitution of $\sqrt{4-x^2}$ is:	(A)	$x = sin\theta$	(B)	$x = 2\ sin\theta$	(C)	$x = sin2\theta$	(D)	$x = 2\ cos\theta$
12.	$\int Tan\ x\ dx =$	(A)	$ln\cos x + c$	(B)	$\frac{1}{ln\ cosx} + c$	(C)	$-ln\lvert\cos x\rvert + c$	(D)	$Sec^2x + c$
13.	Solution of differential equation: $(e^x + e^{-x})\frac{dy}{dx} = e^x - e^{-x}$ is:								
	(A) $-ln(e^x + e^{-x}) + c$	(B)	$ln(e^x - e^{-x}) + c$	(C)	$ln(e^x + e^{-x}) + c$	(D)	$\frac{(e^x + e^{-x})^2}{2}$		
14.	$\int SinxCos\ x\ dx =$	(A)	$\frac{Sin^2x}{2} + c$	(B)	$\frac{Cos^2x}{2} + c$	(C)	$-Sin\ x + c$	(D)	$Cosx + c$
15.	The line: $ay + b = 0$ is	(A)	Parallel to y-axis	(B)	Parallel to x-axis	(C)	Passing through origin	(D)	Lies in Quad. I
16.	The slope of line joining the points $(-2, 4)$; $(5, 11)$ is:	(A)	1	(B)	-1	(C)	45°	(D)	$-45°$
17.	The location of the plane of the point P(x, y) for which y = 0 at:	(A)	$Origin$	(B)	$y - axis$	(C)	$x - axis$	(D)	$Ist\ Quad$
18.	The maximum and minimum values occur at:	(A)	Corner point	(B)	Any point	(C)	Convex region	(D)	Corner points of feasible region
19.	The line intersect the circle at:	(A)	One point	(B)	Two points	(C)	Infinite points	(D)	More than two points
20.	Diameter of circle: $x^2 + y^2 = 16$ is:	(A)	8	(B)	4	(C)	16	(D)	32

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Roll No _____ to be filled in by the candidate

HSSC-(P-II)-A/2024

(For All Sessions)

(GROUP-II)

Marks : 80

Time: 2:30 hours

Mathematics (Subjective)

SECTION-I RWP-2-24

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 $\acute{f}(x)$ 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 $\acute{O}(-3,2)$. 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 $y = \frac{lnx}{x}$ 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)