HSSC-(P-II)-A/2023

Paper Code	8	1	9	1

Roll No [redacted] to be filled in by the candidate

(For All Sessions)

(Group-I)

Time: 30 Minutes Marks : 20

Mathematics (Objective)

Rwp-12-1-23

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	$\lim_{x\to 0}\frac{e^{2x}-1}{x}=?$	(A)	1	(B)	2	(C)	0	(D)	-2
2.	$\cosh x+\sinh x=?$	(A)	e^x	(B)	e^{-x}	(C)	e^{2x}	(D)	$2e^x$
3.	$\frac{d}{dx}[\ln(2^x)]=?$	(A)	$ln2$	(B)	2^x	(C)	$\frac{1}{2^x}$	(D)	$\frac{ln2}{2^x}$
4.	$\frac{d}{dx}(\cosh x)=?$	(A)	$-\sinh x$	(B)	$\sinh x$	(C)	$\operatorname{sech} x$	(D)	$\operatorname{cosec} hx$
5.	If $f(x)=\sqrt{x}$, then $f^1(0)=?$	(A)	0	(B)	1	(C)	Undefined	(D)	$1/2$
6.	$\frac{d}{dx}(\sin^{-1}x+\cos^{-1}x)=?$	(A)	1	(B)	0	(C)	-1	(D)	2
7.	$\int o dx=?$	(A)	x	(B)	$1/x$	(C)	x^2	(D)	C
8.	$\int e^x(x+1)\,dx=?$	(A)	xe^x+c	(B)	e^x+c	(C)	$x+c$	(D)	x^2+c
9.	$\int_0^{\pi/2}\cos x\,dx=?$	(A)	0	(B)	-1	(C)	1	(D)	2
10.	$\int\frac{\sin 2x}{\sin x}dx=?$	(A)	$2\cos x+c$	(B)	$2\sin x+c$	(C)	$\frac{1}{2}\sin x+c$	(D)	$\frac{1}{2}\cos x+c$
11.	The slope of a line $x=5$ is:	(A)	0	(B)	1	(C)	-1	(D)	Infinite
12.	Midpoint of (0, -2) and (-2,0) is:	(A)	$(0,\ 0)$	(B)	$(-1,-1)$	(C)	$(-2,-2)$	(D)	$(0,-1)$
13.	Distance between $(-1, 2)$ & $(7, 5)$ is:	(A)	$\sqrt{73}$	(B)	7	(C)	$2\sqrt{73}$	(D)	73
14.	The solution of inequality $x+2y<6$ is:	(A)	$(1,\ 4)$	(B)	$(1,\ 3)$	(C)	$(1,\ 1)$	(D)	$(1,\ 5)$
15.	Equation of Tangent to $x^2+y^2=4$ at $(2,\ 0)$ is:	(A)	$x=1$	(B)	$y=1$	(C)	$y=2$	(D)	$x=2$
16.	Slope of tangent to parabola $y^2=4ax$ at $(a, 2a)$ is:	(A)	2	(B)	-1	(C)	1	(D)	3
17.	Eccentricity e of a circle is:	(A)	$e=0$	(B)	$e=1$	(C)	$0<e<1$	(D)	$e>1$
18.	Radius of a circle $x^2+y^2=2$ is:	(A)	2	(B)	1	(C)	$1/2$	(D)	$\sqrt{2}$
19.	If $P=(2,3), Q=(6,-2)$, then $\lvert\overrightarrow{PQ}\rvert$ is	(A)	$\sqrt{40}$	(B)	$\sqrt{42}$	(C)	$\sqrt{41}$	(D)	$\sqrt{43}$
20.	For a vector $\vec{V}=2\hat{i}+3\hat{j}-6\hat{k}$, then $\cos\beta=?$	(A)	$\frac{3}{7}$	(B)	$\frac{2}{7}$	(C)	$-\frac{6}{7}$	(D)	$-\frac{3}{7}$

to be filled in by the candidate

HSSC-(P-II)-A/2023
(For All Sessions)
(GROUP-I)

Marks : 80

.hematics (Subjective)

Time: 2:30 hours

SECTION-I

Rwp-12-1-23

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

i. Express perimeter P of a square as a function of its area A.

ii. Evaluate $\lim_{x\to 0} \frac{\sin x^0}{x}$

iii. Define even function with example.

iv. If $y = x^4 + 2x^2 + 2$, prove that $\frac{dy}{dx} = 4x\sqrt{y-1}$

v. Find derivative by definition $\frac{1}{\sqrt{x}}$

vi. Find $\frac{dy}{dx}$; $xy + y^2 = 2$

vii. Differentiate w.r.t x, $y = x^2 sec4x$

viii. Differentiate w.r.t x, $y = cot^{-1}\left(\frac{x}{a}\right)$

ix. Find $\frac{dy}{dx}$ if $y = x\sqrt{lnx}$

x. Apply the Maclaurin series to prove that: $e^{2x} = 1 + 2x + \frac{4x^2}{2!} + \frac{8x^3}{3!} + \cdots$

xi. Graph the solution set of $2x + y \leq 6$.

xii. Define feasible region.

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

i. Evaluate $\int tan^2 x dx$.

ii. Evaluate $\int \frac{(a-b)x}{(x-a)(x-b)} dx$

iii. Evaluate $\int x\, sinx dx$.

iv. Evaluate $\int_{\pi/6}^{\pi/3} cost\, dt$

v. Solve the differential equation $y\,dx + x\,dy = 0$

vi. Evaluate $\int \frac{x^2}{4+x^2} dx$

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

viii. Find a unit vector in the direction of $\underline{V} = \frac{1}{2}\underline{i} + \frac{\sqrt{3}}{2}\underline{j}$

ix. Find direction cosines of $\underline{V} = 4\underline{i} - 5\underline{j}$

x. Find $\propto$, so that vector $\underline{u} = 2\propto \underline{i} + \underline{j} - \underline{k}$, $\underline{v} = \underline{i} + \propto \underline{j} + 4\underline{k}$ are perpendicular.

xi. Find the area of parallelogram whose vertices are: $A(0,0,0)$ $B(1,2,3)$ $C(2,-1,1)$ $D(3,1,4)$

xii. A force $\vec{F} = 7\underline{i} + 4j - 3\underline{k}$ is applied at $p(1,-2,3)$. Find its amount about the point $Q(2,1,1)$

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

i. Is $(\sqrt{176}, 7)$ at a distance of 15 units from the origin?

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

iii. Find K so that the line joining $A(7,3)$; $B(k,-6)$ and the line joining $C(-4,5), D(-6,4) are\ parallel.$

iv. Find the equation of the line having $y - intercept - 7$ and $slope - 5$.

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

vi. Find equation of lines represented by $2x^2 + 3xy - 5y^2 = 0$

vii. Find the measure of the angle between the lines represented by $9x^2 + 24xy + 16y^2 = 0$

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

ix. Show that the line $2x + 3y - 13 = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$

x. Check the position of the point $(5,6)$ with respect to the circle $x^2 + y^2 = 81$.

xi. Find focus and directrix of the parabola $x^2 = -16y$

xii. Find an equation of ellipse if foci $(-3\sqrt{3}, 0)$ and vertices $(\pm 6, 0)$.

xiii. Find equation of hyperbola with given data foci $(0, \pm 9)$, directrices $y = \pm 4$

SECTION-II

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

5. (a) Evaluate: $\lim_{x\to 0} \frac{Secx - Cosx}{x}$

(b) If $y = \tan(2\, tan^{-1}\frac{x}{2})$, then show that $\frac{dy}{dx} = 4(\frac{1+y^2}{4+x^2})$

6. (a) Evaluate: $\int \frac{dx}{\frac{1}{2}Sinx + \frac{\sqrt{3}}{2}Cosx}$

(b) Find equation of line through intersection of $x + 2y + 3 = 0$, $3x + 4y + 7 = 0$ and making equal intercepts on the axes.

7. (a) Find the area bounded by the curve $f(x) = x^3 - 2x^2 + 1$ and $x - axis$ in the 1st quadrant.

(b) Minimize $Z = 3x + y$ subject to the constraints $3x + 5y \geq 15$ $x + 6y \geq 9$ $x \geq 0$, $y \geq 0$

8. (a) If $y = a\cos(lnx) + b\, sin(lnx)$ prove that $x^2\frac{d2y}{dx^2} + x\frac{dy}{dx} + y = 0$

(b) Find the coordinates of the points of intersection of the line $2x + y = 5$ and the circle $x^2 + y^2 + 2x - 9 = 0$, also find the length of intercepted chord.

9.(a) Find the centre foci, accentricity and vertices of the ellipse
$x^2 + 16x + 4y^2 - 16y + 76 = 0$

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Roll No _____ to be filled in by the candidate

HSSC-(P-II)-A/2023

(For All Sessions)

Group-II

Paper Code	8	1	9	6

Mathematics (Objective)

Time: 30 Minutes Marks : 20

Rwp-12-2-23

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 $A(1,2)$ & $B(3,8)$ is:	(A)	$(2,5)$	(B)	$(4,10)$	(C)	$(2,6)$	(D)	$(2,8)$
2.	$(1,-3)$ is in the solution of _____.	(A)	$x+y\geq 1$	(B)	$x+y\leq 0$	(C)	$x+y=0$	(D)	$x-y=0$
3.	Centre of circle $x^2+y^2-6x+4y+13=0$	(A)	$(3,2)$	(B)	$(-3,2)$	(C)	$(3,-2)$	(D)	$(-3,-2)$
4.	Focus of parabola $x^2=4ay$ is:	(A)	$(-a,o)$	(B)	$(o,-a)$	(C)	(a,o)	(D)	(o,a)
5.	Eccentricity e for hyperbola is:	(A)	$e=1$	(B)	$e=0$	(C)	$e<1$	(D)	$e>0$
6.	Length of major axis of $\frac{x^2}{9}+\frac{y^2}{4}=1$	(A)	03	(B)	06	(C)	02	(D)	04
7.	Which one is not scalar quantity:	(A)	Work	(B)	Time	(C)	Magnetic field	(D)	Speed
8.	$[\underline{k}\,\underline{i}\,\underline{j}]$	(A)	2	(B)	0	(C)	1	(D)	-1
9.	$\lim_{x\to 2}\sqrt{x^3+1}-\sqrt{x^2+5}$	(A)	-1	(B)	0	(C)	2	(D)	-2
10.	Area of circle of unit radius is:	(A)	π	(B)	2π	(C)	π^2	(D)	$2\pi^2$
11.	$\frac{d}{dx}(3^x)=$ _____	(A)	$3^x lnx$	(B)	$3^x ln2$	(C)	$3^x ln3$	(D)	$x\,3^{x-1}$
12.	Lagrange used____ notation for derivative.	(A)	$D\,f(x)$	(B)	$f^1(x)$	(C)	$\frac{d}{dx}f(x)$	(D)	$\dot{f}(x)$
13.	$\frac{d}{dx}\,cos7x =$ ----------.	(A)	$7\,Sin\,7x$	(B)	$-7\,Sin\,7x$	(C)	$7\,Cos\,7x$	(D)	$-7\,Cos\,7x$
14.	Minimum value of function $f(x)=x^2+2x-3$ is at $x=$__.	(A)	-3	(B)	-2	(C)	0	(D)	-1
15.	$\int\frac{1}{1+x^2}dx=$ _____.	(A)	$Sin^{-1}x+c$	(B)	$Cos^{-1}x+c$	(C)	$Tan^{-1}x+c$	(D)	$Cot^{-1}x+c$
16.	$\int\frac{1}{x^2}dx =$ ----------.	(A)	$-\frac{1}{x}+c$	(B)	$\frac{1}{x}+c$	(C)	$\frac{2}{x}+c$	(D)	$\frac{-2}{x}+c$
17.	Solution of $\frac{dy}{dx}=1$ *is*_____.	(A)	$y=x^2+c$	(B)	$y=e^x+c$	(C)	$y=lnx+c$	(D)	$y=x+c$
18.	$\int_0^1 3x^2dx=$ _____.	(A)	3	(B)	1	(C)	2	(D)	0
19.	Equation of line through origin with slope 2:	(A)	$2x-y=0$	(B)	$2x+y=0$	(C)	$x+2y=0$	(D)	$x-2y=0$
20.	Slope of line parallel to y-axis:	(A)	-1	(B)	0	(C)	∞	(D)	1

to be filled in by the candidate

HSSC-(P-II)-A/2023

Marks : 80

ematics (Subjective) (For All Sessions) (GROUP-II) Time: 2:30 hours

SECTION-I

Rwp-12-2-23

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

i. Express perimeter P of a square as a function of its area A.

ii. If $f(x) = (-x+9)^3$, find $f^{-1}(x)$

iii. Find $\lim_{x\to 0} \frac{1-Cos2x}{x^2}$

iv. Differentiate w.r.t "x" $(\sqrt{x} - \frac{1}{\sqrt{x}})^2$

v. If $y = \sqrt{x+\sqrt{x}}$ find $\frac{dy}{dx}$

vi. Find $\frac{dy}{dx}$ if $x = y\,Siny$

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

viii If $y = x^2.\ln\left(\frac{1}{x}\right)$, find $\frac{dy}{dx}$

ix. If $y = Sin\,h^{-1}\left(\frac{x}{2}\right)$, Find $\frac{dy}{dx}$

x. Apply the Maclaurin series to prove that: $\sqrt{1+x} = 1 + \frac{x}{2} - \frac{x^2}{8} + \ldots\ldots$

xi. Graph the solution set of linear inequality in $xy-plane$, $2x + y \le 6$

xii. What is a feasible solution?

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

i. Using differentials find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ for $x^2 + 2y^2 = 16$

ii. Evaluate: $\int \frac{(1-\sqrt{x})^2}{\sqrt{x}}\,dx$

iii. Evaluate: $\int \frac{x+2}{\sqrt{x+3}}\,dx$

iv. Evaluate: $\int tan^{-1}x\,dx$

v. Evaluate: $\int \frac{5x+8}{(x+3)(2x-1)}\,dx$

vi. Evaluate $\int_{-2}^{0} \frac{1}{(2x-1)^2}\,dx$

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

viii Find sum of $\overline{AB}$ and $\overline{CD}$ where $A(1,-1)$, $B(2,0)$, $C(-1,3)$ and $D(-2,2)$

ix. Find direction Cosines of vector $\underline{V} = 3\underline{i} - \underline{j} + 2\underline{k}$

x. Find $\propto$ so that $U = 2\propto \underline{i} + \underline{j} - \underline{k}$ and $\underline{V} = \underline{i} + \propto \underline{j} + 4\underline{k}$ and perpendicular.

xi. Compute $\underline{a} \times \underline{b}$ and $\underline{b} \times \underline{a}$ for $\underline{a} = \underline{i} + \underline{j}$, $\underline{b} = \underline{i} - \underline{j}$

xii. Find volume of parallelopiped determined by $\underline{U} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{V} = \underline{i} - 2\underline{j} + 3\underline{k}$ and $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$

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

i. The point $C(-5,3)$ is the center of the circle and $P(7,2)$ lies on the circle. What is the radius of the circle.

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

iii. The points $P(-2,6)$ and $O(-3,2)$ are given in $xy-coordinate$ system. Find the $XY-Coordinte$ of P referred to the translated axes OX and OY.

iv. Find an equation of the line through $(-5,-3)$ and $(9,-1)$.

v. Convert $4x + 7y - 2 = 0$ in slope-intercept form.

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

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

viii. Find center and radius of circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$

ix. Find focus and vertex of parabola $y^2 = -12x$

x. Find foci of an ellipse $9x^2 + y^2 = 18$

xi. Find eccentricity of hyperbola, $\frac{y^2}{4} - x^2 = 1$

xii. Write parametric equations of hyperbola.

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

SECTION-II

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

5. (a) Evaluate: $\lim_{x\to 0} \frac{Secx - Cosx}{x}$

(b) Find $\frac{dy}{dx}$ if $x\sqrt{1+y} + y\sqrt{1+x} = 0$.

6. (a) Evaluate: $\int \frac{x}{x^4 + 2x^2 + 5}\,dx$

(b) Find equation of the line through $(5,-8)$ and perpendicular to the join of $A(-15,-8)$ and $B(10,7)$.

7. (a) Solve the differential equation $\left(y - x\frac{dy}{dx}\right) = 2(y^2 + \frac{dy}{dx})$

(b) Graph the feasible region of the following system of linear inequalities and find the corner points.
$2x + y \le 10$, $x + 4y \le 12$, $x + 2y \le 10$ $\quad x \ge 0, y \ge 0$

8. (a) Show that $y = \frac{lnx}{x}$ has maximum value at $x = e$.

(b) Write an equation of the circle that passes through the given points $A(4,5)$, $B(-4,-3)$, $C(8,-3)$

(c) Find the focus, vertex and directrix of the parabola $x^2 - 4x - 8y + 4 = 0$