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Roll No [redacted] 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.	$\frac{d}{dx}\cos 7x =$ ----------.	(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 $A(4,5)$, $B(-4,-3)$, $C(8,-3)$

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