Version No.				
4	0	0	8	5

ROLL NUMBER						

MATHEMATICS HSSC-II

SECTION – A (Marks 20)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اوّل لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Answer Sheet No. _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پُر کریں۔ **Invigilator Sign.** _____

Fill the relevant bubble against each question according to curriculum: **Candidate Sign.** _____

	Question	A	B	C	D	A	B	C	D
1.	If $z = x^2 + xy + y^2$, then $\frac{\partial z}{\partial x}$ is:	$2x + 2y$	$x + y$	$2x + x$	$2x + y$	○	○	○	○
2.	The equation $x^2 - 9 = 0$ has a root between:	$[2, 5]$	$[5, 7]$	$[0, -2]$	$[0, 1]$	○	○	○	○
3.	Which of the methods finds the root fastest (if $f'(x) \neq 0$)?	Regula-Falsi	Trapezoidal	Bisection	Newton–Raphson	○	○	○	○
4.	If $f(x) = x + 5$ and $g(x) = \sqrt{x}$, then $g[f(x)]$ is expressed as:	$x^2 - 5$	$\sqrt{x + 5}$	$(x - 5)^2$	$x^2 + 5$	○	○	○	○
5.	If $\lim_{x \to 1} f(x) = 4$ and $\lim_{x \to 1} g(x) = 0$, then $\lim_{x \to 1} \frac{f(x)}{g(x)}$ results:	0	Does not exist	1	4	○	○	○	○
6.	What is the derivative of (x^x) w. r. t. x.?	$x^x\,(1 + lnx)$	$xlnx$	$x.x^{x-1}$	$x^x.lnx$	○	○	○	○
7.	If $y = cothx^2$, then $\frac{dy}{dx}$ is:	$-2xcschx^2$	$cschx^2$	$2xcschx^2$	$-cschx^2$	○	○	○	○
8.	The point on $y = \sqrt{x}$ where tangent is parallel to x-axis is:	(1, 1)	No such point	(4, 2)	(0, 0)	○	○	○	○
9.	If $f(t) = t^2\hat{\imath} + 3t\hat{\jmath}$, then $f'(t)$ is:	$2\hat{\imath} + 3\hat{\jmath}$	$2t\hat{\imath} + 3t\hat{\jmath}$	$2t\hat{\imath} + 3\hat{\jmath}$	$t^3\hat{\imath} + 3t^2\hat{\jmath}$	○	○	○	○
10.	If $f(t) = 3t\hat{\imath} + 4t^2\hat{\jmath}$, then the acceleration vector is:	$8t\hat{\jmath}$	$3\hat{\imath}$	0	$8\hat{\jmath}$	○	○	○	○
11.	The evaluated value of $\int \frac{2x}{x^2+4} dx$ is:	$\tan^{-1}\frac{x}{2} + c$	$ln\lvert x^2 + 4\rvert + c$	$\frac{1}{2}ln\lvert x^2 + 4\rvert + c$	$\frac{1}{2}\tan^{-1}\frac{x}{2} + c$	○	○	○	○

	Question	A	B	C	D	A	B	C	D
12.	The evaluated value of $\int_0^{\pi} sinx\, dx$ is:	0	1	2	-1	○	○	○	○
13.	What are the coordinates of a point dividing line segment joining O (0, 0) and P (6, 0) internally in ratio 2:1?	(0, 4)	(4, 4)	(2, 0)	(4, 0)	○	○	○	○
14.	Perpendicular distance from (3,4) to the line $3x + 4y - 10 = 0$ is:	3	2	1	4	○	○	○	○
15.	Find the length of tangent drawn from (10,5) to the circle $x^2 + y^2 = 125$	5	10	15	0	○	○	○	○
16.	The centre and radius of the circle $x^2 + y^2 + 6x + 8y + 9 = 0$ is:	(3, 4); 4	(−3, −4); 4	(3, 4); 5	(3, −4); 5	○	○	○	○
17.	The equation of tangent to a parabola $y^2 = 4x$ at point P(4,4) is:	$4y = 2(x - 4)$	$4y = 4(x + 4)$	$y = 2(x + 4)$	$4y = 2(x + 4)$	○	○	○	○
18.	The ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$becomes a circle when:	$a < b$	$a > b$	$a = b$	$a = 0$	○	○	○	○
19.	The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \frac{dy}{dx} = x$ is:	3	5	6	2	○	○	○	○
20.	The solution of $\frac{dy}{dx} = x$ is:	$y = \frac{1}{2}x^2 + c$	$y = 2x + c$	$y = x + c$	$y = x^2 + c$	○	○	○	○

ROLL NUMBER						

MATHEMATICS HSSC–II

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Time allowed: 2:35 Hours **Total Marks Sections B and C: 80**

SECTION – B (Marks 48)

Q. 2 Solve the following: **(12 x 4 = 48)**

(i)	Sketch the graph of $y = \|x-2\|$ and find its domain and range.	04	OR	Evaluate $\int \frac{dx}{x^2\sqrt{x^2-9}}$	04
(ii)	Differentiate $y = (x+4)^{\frac{1}{2}}$ from first principles.	04	OR	Find area between $y = x^2 - 3x$ and x-axis from $x = 0$ to $x = 4$	04
(iii)	Find area of a triangle having vertices A(1,2), B(4,6) and C(5,2).	04	OR	Find orthogonal trajectory of the family of circles $x^2 + y^2 = a^2$	04
(iv)	Differentiate $y = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w. r. t. x.	04	OR	Approximate $\int_0^1 (1+x)\,dx$ using Simpson's rule with $n = 2$.	04
(v)	If $f(x) = \sqrt{x}$ and $g(x) = x$, then find $f(g(x))$, $g(f(x))$, $f(f(x))$ and $g(g(x))$.	04	OR	Find equation of tangent to the circle $x^2 + y^2 - 6x - 8y + 9 = 0$ at the point (5,3).	04
(vi)	Evaluate $\lim_{t\to 1}[f(t) \times g(t)]$ with $f(t) = (t^2-1)\hat{\imath} + \sqrt{t}\hat{\jmath} + 5\hat{k}$ and $g(t) = (sin\pi t)\hat{\imath} + e^{t-1}\hat{\jmath} + 3t\hat{k}$	04	OR	Use Euler's theorem to verify that, $f(x,y) = 3x^2y + 2xy^2$ is a homogeneous function of degree 3.	04
(vii)	Find domain of each component and overall domain of the vector function $f(t) = (t+1)\hat{\imath} + \frac{1}{t-2}\hat{\jmath} + \sqrt{t+3}\hat{k}$	04	OR	Evaluate $\lim_{x\to 0}\left(\frac{x\,sin4x}{1-cos2x}\right)$	04
(viii)	Reduce the equation $6x + 8y - 48 = 0$ to slope intercept form, two intercepts form and normal form.	04	OR	Use Maclaurin's theorem to expand sin(x) up to the term containing x^3.	04
(ix)	Differentiate implicitly to find $\frac{dy}{dx}$ if $x^3y^2 + xy + y^3 = 10$.	04	OR	Find equation of a parabola with **focus** (0,1) and **directrix** $y + 1 = 0$.	04
(x)	Find the first-order partial derivatives $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ of the function $z = e^{xy} + x^{3y}$	04	OR	Find center and radius of the circle $2x^2 + 2y^2 - \frac{5}{2}x + \frac{3}{2}y - \frac{7}{4} = 0$	04
(xi)	Solve the separable differential equation $\frac{dy}{dx} = \frac{y}{x+1}$	04	OR	Find equation of tangent to the hyperbola $\frac{2}{3}x^2 - \frac{3}{5}y^2 = 1$ at point $\left(\frac{3\sqrt{6}}{2}, \frac{5}{3}\right)$.	04
(xii)	Find equation of an ellipse with **foci** $(\pm 2, 0)$ and **vertices** $(\pm 3, 0)$.	04	OR	Find the **second derivative** of $y = x^2e^{2x}$	04

SECTION – C (Marks 32)

Note: Solve the following Questions. **(4 x 8 = 32)**

Q.3	Test continuity of the function $f(x) = \begin{cases} \frac{x^2-4}{x-2} & x < 2 \\ \frac{5}{3}x + \frac{2}{3} & 2 \le x < 5 \\ x^2 - 16 & x \ge 5 \end{cases}$ at $x = 2$ and $x = 5$	4+4	OR	Use Bisection method to find a real root of $f(x) = x^3 - 3x + 1 = 0$ Take initial interval [0,1], perform four iterations and give approximate root after the 4th iteration.	08
Q.4	A particle is moving in 3D space with position vector $r(t) = (2t^2+1)\hat{\imath} + 3e^{2t}\hat{\jmath} + (4cos3t)\hat{k}$ where t is time in seconds. Find velocity, speed, direction and acceleration of the particle at time $t = 0$ sec.	08	OR	Find equation of a circle passing through points A (1,2), B (4,3) and C (2,5)	08
Q.5	Solve the homogeneous differential equation $\frac{dy}{dx} = \frac{x+y}{x-y}$	08	OR	Evaluate $\int \frac{6x^2+5x+4}{x(x+1)(x-1)(x+2)}dx$	08
Q.6	Find equations of **medians** of a triangle whose vertices are A (2,3), B (6,7) and C (4,1).	08	OR	Examine the extreme values of $f(x) = sinx\,cosx$, where $x \in [0, \pi]$.	08