Version No.			
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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 دیے گئے خانوں میں 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 $f(x)=x^2+1$ and $g(x)=x-1$, then $g(f(x))=$	x^2	x^2-1	x^2+1	x^2-2	○	○	○	○
2.	If $f(y)=y^y$, then $f'(y)=$	$y^y \ln y$	$y^y(1+\ln y)$	$y^y(1-\ln y)$	$y.y^{y-1}$	○	○	○	○
3.	$\frac{d}{dx^2}(x^{-6})=$	$-6x^{-4}$	$-3x^{-4}$	$-6x^{-5}$	$-3x^{-8}$	○	○	○	○
4.	$\frac{d}{dx}(\text{Cos}\,x°)=$	$-\text{Sin}\,x°$	$\text{Cos}\,x°$	$-\frac{\pi}{180}\text{Cos}\,x°$	$-\frac{\pi}{180}\text{Sin}\,x°$	○	○	○	○
5.	The Maclaurin series expansion of e^x is:	$1-\frac{x}{1!}+\frac{x^2}{2!}-\frac{x^3}{3!}+\ldots$	$1+\frac{x}{1!}+\frac{x^2}{2!}+\frac{x^3}{3!}+\ldots$	$1-\frac{x^2}{2!}+\frac{x^4}{4!}-\frac{x^6}{6!}+\ldots$	$x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\ldots$	○	○	○	○
6.	If $\int\frac{f'(x)}{f(x)}dx=\ln\text{Sin}\,x+c$, then $f(x)=\ldots$	$\text{Cos}\,x$	$\text{Sin}\,x$	$-\text{Cos}\,x$	$-\text{Sin}\,x$	○	○	○	○
7.	$\int_{-1}^{1}(x+\lvert x\rvert)dx=\ldots$	-1	0	1	2	○	○	○	○
8.	The area bounded by the graph of $y=x^2$ and $x-$axis from $x=-1$ to $x=1$ is:	$-\frac{1}{3}$	0	$\frac{1}{3}$	$\frac{2}{3}$	○	○	○	○
9.	Evaluate $\int_0^1(e^x-e^{-x})dx$	$-2\text{Cosh}(1)$	$-2\text{Sinh}(1)$	$2\text{Sinh}(1)$	$2\text{Cosh}(1)$	○	○	○	○
10.	Evaluate $\int\frac{Cot(\ln x)}{x}dx$	$\ln Cot(\ln x)+C$	$\ln\text{Sin}(\ln x)+C$	$\ln\text{Cos}(\ln x)+C$	$\text{Sin}(\ln x)+C$	○	○	○	○
11.	If slope of a line is $-\sqrt{3}$, then inclination of the line is:	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	○	○	○	○

	Question	A	B	C	D	A	B	C	D
12.	What is the distance of the origin $O(0,0)$ from the line $3x+4y-25=0$?	25	$\sqrt{25}$	5	$\frac{1}{\sqrt{25}}$	○	○	○	○
13.	For what value of k the slope of the line passing through the points $(7,3)$ and $(k,-6)$ is -1.	16	9	-9	7	○	○	○	○
14.	The minimum value of $f(x,y)=4x+5y$ subject to the constraints $x\le 4$, $y\le 2$ and $x\ge 1$ is at the point:	$(4,2)$	$(1,2)$	$(1,0)$	$(4,0)$	○	○	○	○
15.	What is the centre of the circle with equation $x^2+y^2-2x+2y-1=0$?	$(1,-1)$	$(-1,1)$	$(-1,-1)$	$(1,1)$	○	○	○	○
16.	What is the length of latus rectum of the parabola $x^2=4ay$?	a	$4a$	$2a$	$8a$	○	○	○	○
17.	What is the eccentricity of the ellipse $\frac{x^2}{25}-\frac{y^2}{16}=1$	$\frac{\sqrt{41}}{5}$	$\frac{\sqrt{41}}{25}$	$\frac{5}{\sqrt{41}}$	$\frac{25}{\sqrt{41}}$	○	○	○	○
18.	What are the directrices of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1, \quad a^2>b^2$	$x=\pm\frac{a}{e}$	$x=\pm\frac{2b^2}{a}$	$x=\pm ae$	$y=\pm\frac{b}{e}$	○	○	○	○
19.	For what value of α, the vectors $6i-8j-2k$ and $3i-2\alpha j-k$ are parallel?	-2	4	$+2$	6	○	○	○	○
20.	What is the projection of vector i on the vector $i-j$?	$\frac{1}{2}$	$\frac{1}{\sqrt{6}}$	6	$\frac{1}{\sqrt{2}}$	○	○	○	○

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MATHEMATICS HSSC–II

20

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

NOTE: Attempt any twelve parts from Section 'B' and any four questions from Section 'C'. Write your answers neatly and legibly.

SECTION – B (Marks 48)

Q. 2 Attempt any TWELVE parts. All parts carry equal marks. (12 x 4 = 48)

(i) Evaluate $\lim_{y\to\pi}\frac{\text{Sin}\, y}{y-\pi}$

(ii) Find the derivative of $\sqrt{x}$ at $x=a$ from the first principle.

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

(iv) If $y=\ln\left(u^2-9\right)$, then find y_4 (the foruth derivative of y w.r.t u)

(v) Apply the Maclaurin series expansion to prove that $\ln(x-1)=x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+\ldots$

(vi) Use differentials and find $\frac{dy}{dx}$ and $\frac{dx}{dy}$, if $xy-\ln y=c$

(vii) Evaluate (i) $\int x\sqrt{x^2-1}dx$ (ii) $\int\frac{\left(\sqrt{x}+1\right)^2}{\sqrt{x}}dx$

(viii) Evaluate $\int\frac{2a}{a^2-y^2}dy$

(ix) Evaluate the following definite integral $\int_0^{\frac{\pi}{4}}\frac{\text{Sec}\theta}{\text{Sin}\theta+\text{Cos}\theta}d\theta$

(x) Find the points trisecting the join of $A(-1,4)$ and $B(10,0)$

(xi) Determine the value of k such that the lines and $2x+ky-1=0, 3x-y-5=0$ and $3x-14y+8=0$ are concurrent.

(xii) Maximize $f(x,y)=x+3y$ subject to the constraints $\begin{cases}2x+5y\le 30\\5x+4y\le 20\\x\ge 0\ \&\ y\ge 0\end{cases}$

(xiii) Write equations of two tangents drawn from $(3,4)$ to the circle $x^2+y^2=4$

(xiv) Find an equation of parabola formed by the cables of a suspension bridge whose span is a and vertical height of tower is b.

(xv) Find a vector whose magnitude is 4 and is parallel to $3\underline{i}-6\underline{j}+2\underline{k}$

(xvi) Prove that $\begin{cases}\underline{u}=\underline{i}-2\underline{j}+3\underline{k}\\\underline{v}=-2\underline{i}+3\underline{j}-4\underline{k}\\\underline{w}=\underline{i}-3\underline{j}+5\underline{k}\end{cases}$ are coplanar.

SECTION – C (Marks 32)

Note: Attempt any FOUR questions. All questions carry equal marks. (4 x 8 = 32)

Q. 3 If $f(x)=\frac{-2x+8}{3x}$, then find $f^{-1}(x)$, and prove that $fof^{-1}(x)=x=f^{-1}of(x)$

Q. 4 Let $f(x)=\text{Cos}\,x$

a. Find, $f'(x), f''(x), f'''(x),\ldots$

b. Using Taylor's theorem show that $\text{Cos}(x+h)=\text{Cos}\,x-h\text{Sin}\,x-\frac{h^2}{2!}\text{Cos}\,x+\frac{h^3}{3!}\text{Sin}\,x-\ldots$ (using part (a))

c. Approximate $\text{Cos}\,59^\circ$ using part (b).

Q. 5 Evaluate $\int\sqrt{a^2-y^2}dy$

Q. 6 Find equations of **(i)** sides **(ii)** altitudes **(iii)** medians of the triangle whose vertices are $A(-3,2), B(5,4)$ and $C(3,-8)$.

Q. 7 Find equation of the circle passing through the origin and point $P(1,1)$ having center on x-axis.

Q. 8 Discuss and sketch the graph of the equation $x^2+2x-4y^2+8y+1=0$ by identifying the curve and

a. derive standard form of the equation of the curve

b. find elements of the curve

c. sketch the graph of the curve *(use of graph paper is **not** necessary)*