Roll No. | | | | | | |

Answer Sh_____

Sig. of Candidate._____

Sig. of Invigilato_____

MATHEMATICS HSSC–II

SECTION – A (Marks 20)

Time allowed: 25 Minutes

NOTE: **Section–A is compulsory and comprises pages 1–2. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Circle the correct option i.e. A / B / C / D. Each part carries one mark.**

(i) A function of the form $f(x,y)=0$ is called _____ function.

A. Parametric B. Implicit C. Explicit D. Identity

(ii) $\lim\limits_{x\to-\infty}\left(e^{x}\right)=$ _____

A. ∞ B. $-\infty$ C. 0 D. 1

(iii) $\dfrac{d}{dx}\left[\dfrac{1}{g(x)}\right]=$ _____

A. $\dfrac{1}{g'(x)}$ B. $\dfrac{-g(x)}{[g(x)]^2}$ C. $\dfrac{-1}{[g(x)]^2}$ D. $\dfrac{-g'(x)}{[g(x)]^2}$

(iv) $\dfrac{1}{\sqrt{x^2-1}}$ is the derivative of_____

A. $\cos^{-1}x$ B. $\sin^{-1}x$ C. $\cosh^{-1}x$ D. $\sinh^{-1}x$

(v) $\int e^{-x}(\cos x-\sin x)dx=$ _____

A. $e^{-x}\sin x+c$ B. $-e^{-x}\sin x+c$ C. $e^{-x}\cos x+c$ D. $-e^{-x}\cos x+c$

(vi) $\int\tan x dx=$ _____

A. $\ln|\cos x|+c$ B. $\ln|\sec x|+c$ C. $\ln|\sec^2 x|+c$ D. $\sec^2 x+c$

(vii) The equation of the line $\dfrac{x-x_1}{\cos\alpha}=\dfrac{y-y_1}{\sin\alpha}=r$ is in the _____

A. Normal form B. Point-slope form

C. Two intercept form D. Symmetric form

(viii) Slope of the line $2x+y-3=0$ is_____

A. 2 B. –2 C. $\dfrac{1}{2}$ D. $-\dfrac{1}{2}$

(ix) In the xy-plane, the graph of the inequality $2x\geq-3$ is the _____

A. Left half plane B. Right half plane

C. Upper half plane D. Lower half plane

(x) The corner point of the boundary lines of inequalities $x-y\leq3,\quad x+2y\leq6$ is _____

A. $(4,1)$ B. $(1,2)$ C. $(1,-1)$ D. $\left(\dfrac{9}{2},\dfrac{1}{2}\right)$

.....

(xi) If $(1,2)$ and $(2,3)$ are ends of a diameter the equation of the circle is _____

A. $(x-1)(y-2)+(x-2)(y-3)=0$ B. $(x-1)(x-2)+(y-2)(y-3)=0$

C. $(x+1)(x+2)+(y+2)(y+3)=0$ D. None of these

(xii) The directrix of the parabola $x^2=5y$ is_____

A. $y=-5$ B. $x=-\frac{5}{4}$ C. $y=\frac{5}{4}$ D. $y=-\frac{5}{4}$

(xiii) The circle is a special case of an ellipse with eccentricity _____

A. 0 B. $\frac{1}{2}$ C. 1 D. $\frac{3}{2}$

(xiv) Which of the following are the direction angles of a vector?

A. $45^0,45^0,60^0$ B. $30^0,45^0,60^0$ C. $45^0,60^0,60^0$ D. $30^0,30^0,45^0$

(xv) The value of scalar triple product $2\underline{i}\times 2\underline{j}.\underline{k}$ is_____

A. $4\underline{i}$ B. 4 C. $4\underline{j}$ D. -4

(xvi) The work done by the force $2\underline{i}+4\underline{j}$ in moving a body from A(0,0) to B (3,5) is_____

A. 6 B. 32 C. 13 D. 26

(xvii) The range of the function $y=coshx$ is_____

A. $(-\infty,+\infty)$ B. $[1,+\infty)$ C. $(1,+\infty)$ D. $[0,+\infty)$

(xviii) The function $f(x)=4x-x^2$ is increasing in the interval _____

A. $0\le x\le 2$ B. $2\le x<4$ C. $0<x<2$ D. $0<x\le 2$

(xix) $\int(a-2x)^{\frac{3}{2}}dx=$_____

A. $\frac{1}{5}(a-2x)^{\frac{5}{2}}+c$ B. $-\frac{1}{5}(a-2x)^{\frac{5}{2}}+c$

C. $\frac{2}{5}(a-2x)^{\frac{5}{2}}+c$ D. $-\frac{2}{5}(a-2x)^{\frac{5}{2}}+c$

(xx) The equation of the vertical line through $(-5,3)$ is_____

A. $x=-5$ B. $x=5$ C. $y=3$ D. $y=-3$

_____

For Examiner's use only:

Total Marks:	**20**
Marks Obtained:	

MATHEMATICS HSSC–II

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

NOTE: Attempt any ten parts from Section 'B' and any five questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 40)

Q. 2 Attempt any TEN parts. All parts carry equal marks. **(10 x 4 = 40)**

(i) Prove the identity $\sec h^2 x = 1 - \tanh^2 x$.

(ii) If $g(x) = (x^2+1)^2$ find $gog(x)$

(iii) If $y = \tan(pTan^{-1}x)$, show that $(1+x^2)y_1 - p(1+y^2) = 0$

(iv) Find the lengths of the side of a variable rectangle having area $36\,cm^2$ when its perimeter is minimum.

(v) If $f(x) = l\,n\sqrt{e^{2x}+e^{-2x}}$ then find $f'(x)$

(vi) Evaluate $\int \sec^4 x\, dx$

(vii) Using the method of substitution, evaluate $\int \frac{\cos x}{\sin x\, ln \sin x} dx$.

(viii) Find the distance between the parallel lines $x+2y-5=0,\ \ 2x+4y=1$

(ix) Find an equation of the line through the point $(2,-9)$ and the intersection of lines $2x+5y-8=0$ and $3x-4y-6=0$.

(x) Find the length of the tangent drawn from the point $(-5,4)$ to the circle $5x^2+5y^2-10x+15y-131=0$

(xi) Write an equation of the parabola with elements: focus $(-3,1)$; directrix $x-2y-3=0$

(xii) Find equation of the hyperbola with centre (2, 2), horizontal transverse axis of length 6 and eccentricity e=2.

(xiii) Solve the differentiatial equation $\frac{ds}{dt} + 2st = 0$.

(xiv) Find the angle between the vectors $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{v} = -\underline{i} + \underline{j}$

SECTION – C (Marks 40)

Note: Attempt any FIVE questions. All questions carry equal marks. **(5 x 8 = 40)**

Q. 3 Prove that $\underset{x\to 0}{Lim}\frac{a^x-1}{x} = \log_e a$

Q. 4 Prove that $y\frac{dy}{dx} + x = 0$ if $x = \frac{1-t^2}{1+t^2},\ y = \frac{2t}{1+t^2}$.

Q. 5 Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \cos^2\theta \cot^2\theta d\theta$

Q. 6 If two vertices of an equilateral triangle are A$(-3,0)$ and B$(3,0)$, find the third vertex. How many of these triangles are possible.

Q. 7 Graph the feasible region of the system of linear inequalities and find the corner points :

$3x+2y \geq 6$, $x+y \leq 4$, $x \geq 0$, $y \geq 0$

Q. 8 Find the equations of the tangents to the circle $x^2+y^2 = 25$ through $(7,-1)$.

Q. 9 Prove that the points whose position vectors are

$A(-6\underline{i}+3\underline{j}+2\underline{k}),\ B(3\underline{i}-2\underline{j}+4\underline{k}),\ C(5\underline{i}+7\underline{j}+3\underline{k}),\ D(-13\underline{i}+17\underline{j}-\underline{k})$ are coplaner.

Roll No. | | | | | | | Answer Sheet No._____

Sig. of Candidate._____ Sig. of Invigilator._____

MATHEMATICS HSSC–II

SECTION – A (Marks 20)

Time allowed: 25 Minutes

NOTE: **Section–A is compulsory and comprises pages 1–2. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Circle the correct option i.e. A / B / C / D. Each part carries one mark.**

(i) Range of the function $f(x) = x^2 + 1$ is_____

A. $(-\infty, \infty)$ B. $(0, \infty)$ C. $[1, \infty)$ D. None of these

(ii) $\lim\limits_{x \to 0}\left(\dfrac{e^x - 1}{x}\right)$ =_____

A. $\ln a$ B. 0 C. ∞ D. 1

(iii) $\dfrac{d}{dx}\cos^{-1}\dfrac{x}{a}$ =_____

A. $\dfrac{-a}{\sqrt{a^2 - x^2}}$ B. $\dfrac{-a}{\sqrt{x^2 - a^2}}$ C. $\dfrac{-1}{\sqrt{a^2 - x^2}}$ D. $\dfrac{-1}{a\sqrt{a^2 - x^2}}$

(iv) $\cosh^{-1} x$ =_____

A. $\ln(x + \sqrt{x^2 - 1})$ B. $\ln(x - \sqrt{x^2 - 1})$

C. $\ln(x + \sqrt{x^2 + 1})$ D. $\ln(x - \sqrt{x^2 + 1})$

(v) $\dfrac{d}{dx}\cosh 2x$ = _____

A. $\sinh 2x$ B. $2\sinh 2x$ C. $-\sinh 2x$ D. $-2\sinh 2x$

(vi) $\lim\limits_{n \to +\infty}\left(1 - \dfrac{1}{n}\right)^n$ =_____

A. e^{-1} B. e C. $-e$ D. None of these

(vii) $\int \sin(a + b)x \, dx$ =_____

A. $-\dfrac{\cos(a + b)x}{a + b} + c$ B. $\dfrac{\cos(a + b)x}{a + b} + c$

C. $-\dfrac{\cos(a + b)x}{a} + c$ D. None of these

(viii) $\int [f(x)]^{-1} f'(x)dx$ =_____

A. $\dfrac{[f(x)]^{-2}}{-2} + c$ B. $[f(x)]^{-1} f(x) + c$

C. $-[f(x)]^{2} + c$ D. $\ln|f(x)| + c$

.....

(ix) $\int_{-6}^{2} \sqrt{3-x}\, dx =$ _____

A. $-\frac{52}{3}$ B. $\frac{56}{3}$ C. $\frac{52}{3}$ D. $-\frac{56}{3}$

(x) Which of the following points is at a distance of 15 units from the origin?

A. $\left(\sqrt{176}, 7\right)$ B. $(10,-10)$ C. $(1, 15)$ D. $\left(\frac{15}{2}, \frac{15}{2}\right)$

(xi) The lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are perpendicular if_____

A. $a_1a_2 + b_1b_2 = 0$ B. $a_1b_2 - a_2b_1 = 0$

C. $a_1a_2 - b_1b_2 = 0$ D. $a_1b_2 + a_2b_1 = 0$

(xii) The measure of angle between the lines represented by $x^2 - xy - y^2 = 0$ is_____

A. 0^0 B. 30^0 C. 45^0 D. 90^0

(xiii) The point which is not included in the solution region of the inequality $2x - 3y \leq 6$ is_____

A. $(6,2)$ B. $(-2,1)$ C. $(1,-2)$ D. $(3,2)$

(xiv) Centre of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is_____

A. (f, g) B. $(-f, -g)$ C. $(-g, -f)$ D. (g, f)

(xv) $y = mx + c$ is tangent to the parabola $y^2 = 4ax$ if_____

A. $c = am$ B. $c = \pm a\sqrt{1 + m^2}$

C. $c = \frac{a}{m}$ D. $c = \frac{m}{a}$

(xvi) The equation $9x^2 - 18x + y^2 + 8y - 23 = 0$ represents a / an_____

A. Circle B. Ellipse C. Parabola D. Hyperbola

(xvii) Projection of a vector $\underline{v} = a\underline{i} + b\underline{j} + c\underline{k}$ along $\underline{i}$ is_____

A. $a\cos\theta$ B. a C. $a\underline{i}$ D. av

(xviii) If vectors $\underline{v} = \underline{i} - 3\underline{j} + 4\underline{k}$ and $\underline{w} = a\underline{i} + 9\underline{j} - 12\underline{k}$ are parallel a= _____

A. 3 B. -3 C. 9 D. 1

(xix) If α, β, γ are the direction angles of a vector, $\cos^2\alpha + \cos^2\beta =$_____

A. 1 B. $-\cos^2\gamma$ C. $\cos^2\gamma$ D. $1 - \cos^2\gamma$

(xx) $\frac{d}{dx}a^x =$_____

A. a^x B. $a^x \ln a$ C. $a^x \ln x$ D. $\frac{a^x}{\ln a}$

_____

For Examiner's use only:

Total Marks: 20

Marks Obtained: _____

MATHEMATICS HSSC–II

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

NOTE: Attempt any ten parts from Section 'B' and any five questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 40)

Q. 2 Attempt any TEN parts. All parts carry equal marks. **(10 x 4 = 40)**

(i) Evaluate $\lim_{\theta \to 0} \frac{1-\cos\theta}{\theta}$.

(ii) If $f(x) = \begin{cases} x+2, & x \leq -1 \\ c-2, & x > -1 \end{cases}$ find c so that $\lim_{x \to -1} f(x)$ exists.

(iii) Find $\frac{dy}{dx}$ by making suitable substitution in the function $y = \sqrt{x+\sqrt{x}}$

(iv) Find $\frac{dy}{dx}$ if $y = (x+1)^x$

(v) Prove that $e^{x+h} = e^x \left\{1 + h + \frac{h^2}{\lfloor 2} + \frac{h^3}{\lfloor 3} + \ldots\right\}$

(vi) Evaluate $\int \frac{\sin\theta}{1+\cos^2\theta} d\theta$

(vii) Find the area bounded by the curve $y = x^3 + 1$, the x-axis and the line x=2.

(viii) Evaluate $\int \frac{1}{1+\sin x} dx$

(ix) Find the point three-fifth of the way along the line segment from $A(-5,8)$ *to* $B(5,3)$

(x) Find the lines represented by the equation $20x^2 + 17xy - 24y^2 = 0$

(xi) Find equations of the tangents to the circle $x^2 + y^2 = 2$ and perpendicular to the line $3x + 2y = 6$.

(xii) Find an equation of the ellipse with foci $(0,-1)$ and $(0,-5)$ and major axis of length 6.

(xiii) Find the focus, vertex and directrix of the parabola $x^2 = 4(y-1)$.

(xiv) If $\underline{a} + \underline{b} + \underline{c} = \underline{0}$ prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$.

SECTION – C (Marks 40)

Note: Attempt any FIVE questions. All questions carry equal marks. **(5 x 8 = 40)**

Q. 3 For the real valued function $f(x) = 3x^3 + 7$, find $f^{-1}(x)$ and verify $f\left(f^{-1}(x)\right) = f^{-1}\left(f(x)\right) = x$.

Q. 4 Differentiate $\tan^2 x$ from the first principles.

Q. 5 Evaluate $\int \frac{2x}{1-\sin x} dx$

Q. 6 Show that the lines $4x - 3y - 8 = 0$, $3x - 4y - 6 = 0$ and $x - y - 2 = 0$ are concurrent and the third line bisects the angle formed by the first two lines.

Q. 7 Graph the solution region of the system of linear inequalities and find the corner points :

$3x + 7y \leq 21$, $2x - y \leq -3$, $y \geq 0$

Q. 8 Write an equation of the circle passing through the points A (a,0), B(0,b), C (0,0).

Q. 9 Find a unit vector perpendicular to the plane containing $\underline{a}$ and $\underline{b}$. Also find sine of the angle between them.

$\underline{a} = -\underline{i} - \underline{j} - \underline{k}$, $\underline{b} = 2\underline{i} - 3\underline{j} + 4k$