Roll No _____ (To be filled in by the candidate)

(Academic Sessions 2019 – 2021 to 2021 – 2023)

MATHEMATICS 223-1st Annual-(INTER PART – II) Time Allowed : 30 Minutes

Q.PAPER – II (Objective Type) GROUP – II Maximum Marks : 20

PAPER CODE = 8194 LHR-12-2-23

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	The mid point of the line segment joining the foci of an ellipse is called : (A) Vertex (B) Directrix (C) Centre (D) Minor axis
2	If (3 , 5) is mid point of (5 , a) and (b, 7) then : (A) $a=4\,,\,b=2$ (B) $a=3\,,\,b=3$ (C) $a=7\,,\,b=-2$ (D) $a=3\,,\,b=1$
3	If 2 and 2 are x and y components of a vector, then its angle with x-axis is : (A) 30° (B) 60° (C) 45° (D) 90°
4	(3 , 2) is not a solution of the inequality : (A) $x-y>1$ (B) $x+y>2$ (C) $3x+5y>8$ (D) $3x-7y<3$
5	$\underline{i}\times\underline{j}=$: (A) $\underline{k}$ (B) $\underline{i}$ (C) $-\underline{k}$ (D) $\underline{j}$
6	Slope of line $3x-2y+5=0$ is : (A) $\frac{-2}{3}$ (B) $\frac{2}{3}$ (C) $\frac{3}{2}$ (D) $\frac{-3}{2}$
7	Length of the diameter of the circle $(x+5)^2+(y-8)^2=12$: (A) $2\sqrt{3}$ (B) 12 (C) 24 (D) $4\sqrt{3}$
8	Transverse axis of the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is : (A) $x=\frac{a}{e}$ (B) $y=0$ (C) $x=0$ (D) $y=\frac{a}{e}$
9	Equation of line in slope intercept form is : (A) $y=mx+c$ (B) $\frac{x}{a}+\frac{y}{b}=1$ (C) $y-y_1=m(x-x_1)$ (D) $x\cos\alpha+y\sin\alpha=p$
10	The condition for a line $y=mx+c$ to be tangent to the circle $x^2+y^2=a^2$ is that : (A) $c=\pm m\sqrt{1+a^2}$ (B) $c=\pm a\sqrt{1+m^2}$ (C) $c=\pm a\sqrt{1-m^2}$ (D) $c=\pm\sqrt{1-m^2}$

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11	$f(x)=f(o)+xf'(o)+\frac{x^2}{2!}f''(o)+\frac{x^3}{3!}f'''(o)+----$ is called : (A) Taylor's series (B) Binomial series (C) Maclaurin's series (D) Laurent series
12	$\lim_{x\to 0}\frac{\sin 7x}{x}=:$ (A) 7 (B) -7 (C) $\frac{-1}{7}$ (D) $\frac{1}{7}$
13	$\int \frac{e^x}{e^x+1}dx=:$ (A) $\ell n(e^x+1)+c$ (B) $\ell n e^x+c$ (C) $e^{-x}+c$ (D) e^x+c
14	$\frac{d}{dx}(x^2+1)^2=:$ (A) $2x(x^2+1)$ (B) $\frac{(x^2+1)^3}{3}$ (C) $2(x^2+1)$ (D) $4x(x^2+1)$
15	$\int \sin^2 x\,dx=:$ (A) $\frac{x}{2}-\frac{\sin 2x}{4}+c$ (B) $\frac{x}{2}+\frac{\sin 2x}{4}+c$ (C) $\frac{x}{2}-\frac{\sin 2x}{2}+c$ (D) $\frac{x}{2}+\frac{\sin 2x}{2}+c$
16	$\frac{d}{dx}(\tan x^2)=:$ (A) $\sec^2 x^2$ (B) $2x\sec^2 x^2$ (C) $-\sec^2 x^2$ (D) $-2x\sec x^2$
17	$\int e^x(\cos x-\sin x)\,dx=:$ (A) $e^x\sin x+c$ (B) $e^x\cos x+c$ (C) $e^x\tan x+c$ (D) $e^x\cot x+c$
18	If $f(x)=\sin x+\cos x$ then $f(x)$ is : (A) Even function (B) Odd function (C) Neither even nor odd (D) Constant function
19	$\int_0^3 \frac{1}{9+x^2}dx=:$ (A) $\frac{\pi}{4}$ (B) $\frac{-\pi}{12}$ (C) $\frac{-\pi}{4}$ (D) $\frac{\pi}{12}$
20	$\frac{d}{dx}(f(x)\sin x)=:$ (A) $f(x)\cos x+f'(x)\sin x$ (B) $f'(x)\sin x-f(x)\cos x$ (C) $f'(x)\cos x$ (D) $f'(x)\cos x+f(x)\sin x$

Roll No _____ (To be filled in by the candidate)

(Academic Sessions 2019 – 2021 to 2021 – 2023)

MATHEMATICS 223-1st Annual-(INTER PART – II) Time Allowed : 2.30 hours

PAPER – II (Essay Type) GROUP – II Maximum Marks : 80

SECTION – I Chk-12-2-23

2. Write short answers to any EIGHT (8) questions : **16**

(i) Find the domain and range of $f(x)=\sqrt{x^2-4}$

(ii) Show that $x=a\sec\theta$, $y=b\tan\theta$ represents the equation of hyperbola.

(iii) If $f(x)=-2x+8$, find $f^{-1}(x)$ and $f^{-1}(-1)$

(iv) Differentiate $(3-x)(x-5)$ w.r.t ' x '

(v) Find derivative of $\sqrt{\frac{1+x}{1-x}}$

(vi) If $y=x^4+2x^2+2$, prove $\frac{dy}{dx}=4x\sqrt{y-1}$

(vii) Find the derivative of $(x^3+1)^9$ w.r.t. ' x '

(viii) Find $\frac{dy}{dx}$ if $y^3-2xy^2+x^2y+3x=0$

(ix) Differentiate w.r.t. variable involved of $\tan^3\theta\sec^2\theta$

(x) Find $\frac{dy}{dx}$ if $y=a^x$

(xi) Define feasible region.

(xii) Graph the feasible region $2x-3y\le 6$ $x\ge 0$, $y\ge 0$

3. Write short answers to any EIGHT (8) questions : **16**

(i) Using differentials to find $\frac{dy}{dx}$ if $xy-\ell nx=c$

(ii) Evaluate $\int\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)dx$

(iii) Evaluate $\int\frac{e^x}{e^x+3}dx$

(iv) Evaluate $\int\ell nx\,dx$

(v) Evaluate $\int_{-6}^{2}\sqrt{3-x}\,dx$

(vi) Find the area bounded by cos function from $x=-\frac{\pi}{2}$ to $x=\frac{\pi}{2}$

(vii) Solve the differential equation $\sec^2 x\tan y\,dx+\sec^2 y\tan x\,dy=0$

(viii) Find the magnitude of the vector $\underline{u}=\hat{i}+\hat{j}$

(ix) Find direction cosines of $\vec{v}=3\hat{i}-\hat{j}+2\hat{k}$

(x) Calculate the projection of $\vec{b}$ along $\vec{a}$ if $\vec{a}=\hat{i}-\hat{k}$; $\vec{b}=\hat{j}+\hat{k}$

(xi) If $\vec{a}=2\hat{i}+\hat{j}-\hat{k}$; $\vec{b}=\hat{i}-\hat{j}+\hat{k}$, find $\vec{b}\times\vec{a}$

(xii) Prove that the vectors $\hat{i}-2\hat{j}+3\hat{k}$, $-2\hat{i}+3\hat{j}-4\hat{k}$ and $\hat{i}-3\hat{j}+5\hat{k}$ are coplanar.

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4. Write short answers to any NINE (9) questions : **18**

(i) Find the equation of the straight line whose slope is 2 and y-intercept is 5.

(ii) Using slopes, show that the triangle with its vertices A (6, 1) , B (2, 7) and C (– 6, – 7) is a right triangle.

(iii) Find an equation of the line through (– 4 , 7) and parallel to the line $2x-7y+4=0$

(iv) Find h such that A (– 1 , h), B (3 , 2) and C (7 , 3) are collinear.

(v) Write intercepts form of equation of straight line.

(vi) Check whether the following lines are concurrent or not

$3x-4y-3=0$

$5x+12y+1=0$

$32x+4y-17=0$

(vii) Find the slope and inclination of the line joining points (– 2 , 4) and (5, 11)

(viii) Find an equation of circle with centre at $(\sqrt{2}\ ,\ -3\sqrt{3})$ and radius $2\sqrt{2}$

(ix) Define focus and directrix of the parabola.

(x) Find the centre and foci of the ellipse $x^2+4y^2=16$

(xi) Find equation of tangent to $y^2=4ax$ at (x_1, y_1)

(xii) Show that the equation $5x^2+5y^2+24x+36y+10=0$ represents a circle. Find its centre.

(xiii) Find an equation of the ellipse with given data : Foci (0 , – 1) and (0 , – 5) and major axis of length 6.

SECTION – II

Note : Attempt any THREE questions.

5. (a) If θ is measured in radians then prove that $\lim_{\theta\to 0}\frac{\sin\theta}{\theta}=1$ 5

(b) Find $\frac{dy}{dx}$ if $y=(1+2\sqrt{x})^3\cdot x^{\frac{3}{2}}$ 5

6. (a) Evaluate $\int \ell n(x+\sqrt{x^2+1})\,dx$ 5

(b) Find equations of two parallel lines perpendicular to $2x-y+3=0$ such that the product of the x-intercept and y-intercept of each is 3. 5

7. (a) Solve the differential equation $2e^x\tan y\,dx+(1-e^x)\sec^2 y\,dy=0$ 5

(b) Maximize $f(x,y)=x+3y$ subject to constraints

$2x+5y\le 30$, $5x+4y\le 20$, $x \ge 0$, $y \ge 0$ 5

8. (a) If $y=e^x\sin x$, show that $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=0$ 5

(b) Find equations of tangents to the circle $x^2+y^2=2$ perpendicular to the line $3x+2y=6$ 5

9. (a) Show that the equation $9x^2-18x+4y^2+8y-23=0$ represents an ellipse. Find its elements and sketch its graph. 5

(b) Prove that in any triangle ABC $c=a\cos B+b\cos A$ 5