

Sign. Dy. Supdnt.

Fictitious Roll No. (For Office Use)

Sign. Candidate

MATHEMATICS

22/01

(★)

(PART -II)

(INTERMEDIATE)

Marks : 20

(OBJECTIVE PART)

Time : 30 Minutes

ATK-22

Note:- Write your Roll No. in space provided. Over writing, cutting, using of lead pencil will result in loss of marks. All questions are to be attempted.

1- Each question has four possible answers, Tick (✓) the correct answer. (20)

1	$x = a \cos \theta$, $y = a \sin \theta$ are parametric equations of a;							
	A	Circle	B	Parabola	C	Ellipse	D	Hyperbola
2	$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} =$							
	A	na^n	B	na^{n+1}	C	na^{n-1}	D	$(n+1)a^{n-1}$
3	If $f(x) = \tan^{-1} x$, then $f'(x) =$							
	A	$\frac{-1}{1-x^2}$	B	$\frac{1}{1-x^2}$	C	$\frac{-1}{1+x^2}$	D	$\frac{1}{1+x^2}$
4	If $y = \ln(\sin x)$, then $\frac{dy}{dx} =$							
	A	$\frac{1}{\sin x}$	B	$\tan x$	C	$\cot x$	D	$\sec x$
5	If $f'(c) = 0$, then $f(x)$ has relative maxima at $x = c$ if;							
	A	$f''(c) = 0$	B	$f''(c) < 0$	C	$f''(c) > 0$	D	$f''(c) \neq 0$
6	$\frac{1}{2} \frac{d}{dx} (\tan^{-1} x - \cot^{-1} x) =$							
	A	$\frac{1}{1+x^2}$	B	$\frac{1}{1-x^2}$	C	$\frac{-1}{1+x^2}$	D	$\frac{-1}{1-x^2}$
7	$\int a^x dx =$							
	A	$a^x + c$	B	$a^x \cdot \ln a + c$	C	$\frac{1}{\ln a} \cdot a^x + c$	D	$\frac{\ln a}{a^x} + c$
8	$\int_{\tan x}^{\tan x} e^{\sec^2 x} \sec^2 x dx =$							
	A	$\tan x + c$	B	$\frac{\sec^2 x}{e} + c$	C	$\frac{\tan x}{e} \cdot \tan x + c$	D	$\frac{\tan x}{e} + c$
9	$\int_{-x}^{-x} e^{-x} [-\sin x + \cos x] dx =$							
	A	$\frac{-x}{e} \sin x + c$	B	$\frac{-x}{e} \cos x + c$	C	$\frac{-x}{e} \tan x + c$	D	$\frac{-x}{e} \cot x + c$
10	The solution of the differential equation $\frac{dy}{dx} = \sec^2 x$, is;							
	A	$y = \cot x + c$	B	$y = \ln x + c$	C	$y = \cos x + c$	D	$y = \tan x + c$

(2)

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11	Slope of the line parallel to $3x - 4y + 5 = 0$, is;							
	A	$\frac{4}{3}$	B	$\frac{3}{4}$	C	$\frac{3}{5}$	D	$\frac{5}{3}$
12	The distance of the point $P(4, -6)$ from x-axis is;							
	A	4	B	-4	C	6	D	-6
13	The lines represented by $ax^2 + 2hxy + by^2 = 0$, are real and distinct if;							
	A	$h^2 - ab < 0$	B	$h^2 - ab = 0$	C	$h^2 - ab \neq 0$	D	$h^2 - ab > 0$
14	Slope of horizontal line is;							
	A	Zero	B	∞	C	1	D	-1
15	$x = 4$ is the solution of the inequality;							
	A	$-2x + 3 > 0$	B	$x + 3 > 0$	C	$x - 3 < 0$	D	$x + 3 < 0$
16	The radius of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, is;							
	A	$g^2 + f^2 + c$	B	$g^2 + f^2 - c$	C	$\sqrt{g^2 + f^2 + c}$	D	$\sqrt{g^2 + f^2 - c}$
17	Length of latus-rectum of the parabola $(y - 2)^2 = -4(x - 7)$, is;							
	A	4	B	-4	C	8	D	-8
18	Vertices of the ellipse $\frac{x^2}{2} + \frac{y^2}{9} = 1$, are;							
	A	$(\pm 3, 0)$	B	$(0, \pm 3)$	C	$(0, \pm \sqrt{2})$	D	$(\pm \sqrt{2}, 0)$
19	Projection of $\underline{a} = \underline{i} - \underline{k}$ along $\underline{b} = \underline{j} + \underline{k}$ is;							
	A	$-\frac{1}{\sqrt{2}}$	B	$\frac{1}{\sqrt{2}}$	C	$\frac{1}{2}$	D	$-\frac{1}{2}$
20	The vectors $\underline{u}$, $\underline{v}$ and $\underline{w}$ are coplanar if;							
	A	$\underline{u} \cdot \underline{v} \times \underline{w} = 0$	B	$\underline{u} \cdot \underline{v} \times \underline{w} = 1$	C	$\underline{u} \cdot \underline{v} \times \underline{w} = 2$	D	$\underline{u} \cdot \underline{v} \times \underline{w} = 3$

(The End)

Note:- Attempt any Twenty Five (25) short questions in all selecting eight from Q. 2 and Q. 3 each and nine from Q. 4.

SECTION - I

2- Write short answers of any eight parts.

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(2 x 8 = 16)

i	Find $\frac{f(a+h)-f(a)}{h}$ and simplify where $f(x) = 6x - 9$	ii	If $f(x) = \frac{1}{\sqrt{x-1}}$, $g(x) = \sqrt{x^2+1}$ Find (a) $f \circ g(x)$ (b) $g \circ f(x)$
iii	Find $\lim_{x \rightarrow +\infty} \frac{2-3x}{\sqrt{3+4x^2}}$	iv	Find $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$
v	Find $\lim_{x \rightarrow \infty} \left(\frac{x}{1+x} \right)^x$	vi	Find the derivative of $\frac{1}{\sqrt{x}}$ w.r.t 'x' by definition.
vii	If $y = \frac{2x-1}{\sqrt{x^2+1}}$ find $\frac{dy}{dx}$	viii	Find $\frac{dy}{dx}$ if $y^2 + x^2 - 4x = 5$
ix	If $y = x \cos y$, find $\frac{dy}{dx}$	x	Find $f'(x)$, if $f(x) = \sin^{-1} \sqrt{1-x^2}$
xi	Find $\frac{dy}{dx}$, if $y = (\ln \tanh x)$	xii	If $y = \sqrt{x} + \frac{1}{\sqrt{x}}$, find y_2

3- Write short answers of any eight parts.

(2 x 8 = 16)

i	Solve the differential equation $\sin y \operatorname{cosec} x \frac{dy}{dx} = 1$	ii	Find area bounded by the curve $y = \sqrt{3-x}$ and above x-axis from $x = -1$ to $x = 2$
iii	Evaluate $\int_1^2 (x^2+1)dx$	iv	Evaluate $\int x^2 \ln x dx$
v	Evaluate $\int \cos \left(\sqrt{x} - \frac{x}{2} \right) \times \left(\frac{1}{\sqrt{x}} - 1 \right) dx$	vi	Evaluate $\int \frac{\sqrt{y}(y+1)}{y} dy$
vii	Find δy and dy if $y = \sqrt{x}$ when x changes from 4 to 4.41	viii	Evaluate $\int \frac{dx}{\sqrt{x+1} - \sqrt{x}}$
ix	Find an equation of a line passing through $(-4,7)$ and parallel to the line $2x - 7y + 4 = 0$	x	Express the lines $3x + 4y - 7 = 0$, $2x - 5y + 8 = 0$, $x + y - 3 = 0$ in matrix form and check whether the lines are concurrent.
xi	Find the two lines represented by $6x^2 - 19xy + 15y^2 = 0$	xii	Find area of the region bounded by the triangle whose vertices are $(a, b+c)$, $(a, b-c)$ and $(-a, c)$

4- Write short answers of any nine parts.

(2 x 9 = 18)

i	Define objective function for linear programming problems.	ii	Graph the solution set of $3x + 7y \geq 21$ linear inequality in xy-plane.
iii	Find the centre and radius of the circle with given equation $x^2 + y^2 - 6x + 4y + 13 = 0$	iv	Determine whether the point $(-5,6)$ lies outside, on or inside the circle $x^2 + y^2 + 4x - 6y - 12 = 0$
v	Find the length of the tangent drawn from the point $(-5,4)$ to the circle $5x^2 + 5y^2 - 10x + 15y - 131 = 0$	vi	Write an equation of the parabola with focus $(2,5)$ and directrix $y = 1$
vii	Find foci of the ellipse $x^2 + 4y^2 = 16$	viii	Find slope of the tangent to the curve $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at $(a \cos \theta, b \sin \theta)$
ix	If $\underline{u} = 2\underline{i} - 7\underline{j}$, $\underline{v} = \underline{i} - 6\underline{j}$ and $\underline{w} = -\underline{i} + 5\underline{j}$ find $\frac{1}{2}\underline{u} + \frac{1}{2}\underline{v} + \frac{1}{2}\underline{w}$	x	Find a unit vector in the direction of $\underline{v} = \underline{i} + 2\underline{j} - \underline{k}$
xi	Find a real number α so that the vectors $\underline{u} = \alpha\underline{i} + 2\alpha\underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \alpha\underline{j} + 3\underline{k}$ are perpendicular.	xii	Compute the cross product $\underline{a} \times \underline{b}$ and $\underline{b} \times \underline{a}$ when $\underline{a} = 3\underline{i} - 2\underline{j} + \underline{k}$, $\underline{b} = \underline{i} + \underline{j}$
xiii	Find cosine of the angle θ between $\underline{u} = \underline{i} - 3\underline{j} + 4\underline{k}$, $\underline{v} = 4\underline{i} - \underline{j} + 3\underline{k}$		

SECTION - II**Note:- Attempt any three questions from this section.****All questions carry equal Marks.****AJK-22****(10x3=30)**

5	(a)	If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} & , x \neq 2 \\ k & , x = 2 \end{cases}$ Find value of k so that f is continuous at $x = 2$	(05)
	(b)	Differentiate ab-initio w.r.t. 'x' $\sin \sqrt{x}$	(05)
6	(a)	Evaluate $\int \frac{2x}{x^6 - 1} dx$	(05)
	(b)	The points $A(-1,2)$, $B(6,3)$ and $C(2,-4)$ are vertices of a triangle. Show that the line joining the midpoint D of AB and the midpoint E of AC is parallel to BC and $DE = \frac{1}{2} BC$	(05)
7	(a)	Solve the differential equation; $y - x \frac{dy}{dx} = 3 \left(1 + x \frac{dy}{dx} \right)$	(05)
	(b)	Graph the solution region of the system of linear inequalities and find the corner point. $3x + 7y \leq 21$ $2x - y \leq -3$ $y \geq 0$	(05)
8	(a)	Find the interior angles of the triangle whose vertices are $A(2,-5)$, $B(-4,-3)$, $C(-1,5)$	(05)
	(b)	Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touch externally.	(05)
9	(a)	Find an equation of the ellipse with foci $(\pm\sqrt{5}, 0)$ and passing through the point $\left(\frac{3}{2}, \sqrt{3}\right)$	(05)
	(b)	Prove that the points whose position vectors are $A(-6\hat{i} + 3\hat{j} + 2\hat{k})$, $B(3\hat{i} - 2\hat{j} + 4\hat{k})$, $C(5\hat{i} + 7\hat{j} + 3\hat{k})$, $D(-13\hat{i} + 17\hat{j} - \hat{k})$ are coplanar.	(05)

(The End)