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MATHEMATICS

21/01,

(Smart Syllabus)

(PART - II)

(INTERMEDIATE)*

Marks : 20

(OBJECTIVE PART)

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Time : 30 Minutes

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	$\frac{d}{dx}(\sin \sqrt{x}) =$						
A	$\cos \sqrt{x}$	B	$-\cos \sqrt{x}$	C	$\frac{-1}{2\sqrt{x}} \cos \sqrt{x}$	D	$\frac{1}{2\sqrt{x}} \cos \sqrt{x}$
2	$\frac{d}{dx}(\sinh^{-1} x) =$						
A	$\frac{1}{\sqrt{1+x^2}}$	B	$\frac{-1}{\sqrt{1+x^2}}$	C	$\frac{1}{\sqrt{1-x^2}}$	D	$\frac{-1}{\sqrt{1-x^2}}$
3	$\int (\sin^2 x + \cos^2 x) dx =$						
A	$\sin x + \cos x + c$	B	$\cos 2x + \sin 2x + c$	C	$x + c$	D	$\frac{1}{2}x^2 + c$
4	$\int (\tan^{-1} x \cdot \frac{1}{1+x^2}) dx =$						
A	$\frac{1}{2}(\tan^{-1} x)^2 + c$	B	$\ln(\tan^{-1} x) + c$	C	$2(\tan^{-1} x)^2 + c$	D	$(\tan^{-1} x)^2 + c$
5	$\int (\frac{1}{x\sqrt{x^2-a^2}}) dx =$						
A	$\frac{1}{a} \tan^{-1}(\frac{x}{a}) + c$	B	$\frac{1}{a} \text{Sec}^{-1}(\frac{x}{a}) + c$	C	$\tan^{-1}(\frac{x}{a}) + c$	D	$\text{Sec}^{-1}(\frac{x}{a}) + c$
6	$\int_0^1 \frac{1}{1+x^2} dx =$						
A	$\frac{\pi}{2}$	B	$\frac{\pi}{6}$	C	$\frac{\pi}{3}$	D	$\frac{\pi}{4}$
7	The function $f(x) = \frac{3x}{x^2+1}$ is _____ function.						
A	Even	B	Odd	C	Linear	D	Quadratic
8	If $g(x) = \frac{1}{x^2}, x \neq 0$ then $gog(x) =$						
A	1	B	x^2	C	x^4	D	$\frac{1}{x^4}$
9	The derivative of $\frac{x^3+2x^2}{x^3}$ equals;						
A	$\frac{2}{x^2}$	B	$\frac{-2}{x^2}$	C	$\frac{1}{2x^2}$	D	$\frac{-1}{2x^2}$
10	$\frac{d}{dx}(x - \frac{1}{x}) =$						
A	$1 - \frac{1}{x}$	B	$1 + \frac{1}{x}$	C	$1 + \frac{1}{x^2}$	D	$1 - \frac{1}{x^2}$

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11	The circle $x^2 + y^2 + 2gx + 2fy + c = 0$, passes through the origin if;							
	A	$c = 0$	B	$c = -1$	C	$c = 1$	D	$c = 2$
12	Focus of the parabola $x^2 = -16y$ is;							
	A	$(0,4)$	B	$(0,-4)$	C	$(4,0)$	D	$(-4,0)$
13	Foci of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, are							
	A	$(\pm a, 0)$	B	$(0, \pm a)$	C	$(\pm ae, 0)$	D	$(0, \pm ae)$
14	The unit vector in the direction of $\underline{v} = 2\underline{i} - \underline{j}$ is							
	A	$\frac{2\underline{i} - \underline{j}}{3}$	B	$\frac{2\underline{i} - \underline{j}}{\sqrt{3}}$	C	$\frac{2\underline{i} - \underline{j}}{5}$	D	$\frac{2\underline{i} - \underline{j}}{\sqrt{5}}$
15	If the vectors $2\underline{i} + 4\underline{j} - 7\underline{k}$ and $2\underline{i} + 6\underline{j} + x\underline{k}$ are perpendicular, then $x =$							
	A	8	B	4	C	2	D	1
16	$2\underline{i} \times 2\underline{j} \cdot \underline{k} =$							
	A	2	B	4	C	8	D	1
17	The distance of the point $(-1, 3)$ from x-axis is;							
	A	1	B	-1	C	3	D	-3
18	Slope of the straight line $ax + by + c = 0$, is;							
	A	$\frac{a}{b}$	B	$-\frac{a}{b}$	C	$\frac{b}{a}$	D	$-\frac{b}{a}$
19	The lines l_1 and l_2 with slopes m_1 and m_2 respectively are perpendicular if;							
	A	$m_1 = m_2$	B	$m_1 m_2 = 1$	C	$m_1 m_2 = -1$	D	$m_1 + m_2 = 0$
20	The point $(1, 2)$ lies in the solution of the inequality;							
	A	$2x + y > 5$	B	$2x + y < 3$	C	$2x + y > 6$	D	$x + 3y > 5$

(The End)

(SUBJECTIVE PART)

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NOTE:- Attempt any TWENTY FIVE (25) short questions in all selecting eight from Q. 2 and Q. 3 each and nine from Q. 4. (25 x 2 = 50)

SECTION - I

2- Write short answers of any eight parts.

(2 x 8 = 16)

i	Find the domain and range of $f(x) = \sqrt{x^2 - 9}$	ii	Determine whether $f(x) = \sin x + \cos x$ is even or odd.
iii	For the functions $f(x) = \frac{1}{\sqrt{x-1}}$ and $g(x) = \frac{1}{x^2}, x \neq 0$ find $f \circ g(x)$ and $g \circ f(x)$	iv	Evaluate $\lim_{n \rightarrow \infty} \left(1 + \frac{3}{n}\right)^{2n}$
v	Differentiate $y = \frac{1}{\sqrt{x}}$ by definitions.	vi	Differentiate $\frac{x^2 - 1}{x^2 - 3}$ w.r.t x
vii	$y = (3x^2 - 2x + 7)^6$ find $\frac{dy}{dx}$	viii	$\tan y(1 + \tan x) = (1 - \tan x)$ show that $\frac{dy}{dx} = -1$
ix	Differentiate $(\ln x)^x$ w.r.t x	x	Find y_2 if $y = (2x + 5)^{\frac{3}{2}}$
xi	Find the extreme values of the function $f(x) = 5x^2 - 6x + 2$	xii	Find $\frac{dy}{dx}$ if $y = e^{-2x} \sin 2x$

3- Write short answers of any eight parts.

(2 x 8 = 16)

i	Find dy if $y = x^2 - 1$ and x changes from 3 to 3.02	ii	Evaluate the integral $\int \frac{(1 - \sqrt{x})^2}{\sqrt{x}} dx, (x > 0)$
iii	Evaluate $\int \frac{1}{x \ln x} dx$	iv	Evaluate the integral $\int e^x \left(\frac{1}{x} + \ln x\right) dx$
v	Evaluate $\int \frac{3x+1}{x^2-x-6} dx$	vi	Evaluate $\int_1^2 (x^2 + 1) dx$
vii	Find the area between the x-axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$	viii	Solve the differential equation $\frac{dy}{dx} = -y$
ix	Show that the point $A(0,2)$, $B(\sqrt{3},-1)$ and $C(0,-2)$ are vertices of a right triangle.	x	Two points P and O' are given in xy-coordinate system. Find the XY-coordinates of P referred to the translated axis. $P(-6,-8)$; $O'(-4,-6)$
xi	Find equation of line through $(-5,-3)$ and $(9,-1)$	xii	Determine the value of P such that the lines, $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

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4- Write short answers of any nine parts.

(2 x 9 = 18)

i	Graph the solution set of given linear inequality in xy -plane, $5x - 4y \leq 20$	ii	Find an equation of the circle with ends of a diameter at $(-3, 2)$ and $(5, -6)$
iii	Write an equation of the parabola with given elements. Focus $(-3, 1)$; directrix $x - 2y - 3 = 0$	iv	Find an equation of directrix of given parabola; $x^2 = 4(y - 1)$
v	Find eccentricity of $\frac{y^2}{16} - \frac{x^2}{9} = 1$	vi	Find Foci and vertices of hyperbola. $9x^2 - 12x - y^2 - 2y + 2 = 0$
vii	Find a unit vector in the direction of the vector $\underline{v} = 2\underline{i} + 6\underline{j}$	viii	Find a vector whose magnitude is 2 and is parallel to $-\underline{i} + \underline{j} + \underline{k}$
ix	Find the direction cosines for the vector: $\underline{v} = 3\underline{i} - \underline{j} + 2\underline{k}$	x	Find the cosine of the angle θ between \underline{u} and \underline{v} : $\underline{u} = [2, -3, 1], \underline{v} = [2, 4, 1]$
xi	Compute $\underline{a} \times \underline{b}$, check your answer by showing that \underline{a} is perpendicular to $\underline{a} \times \underline{b}$. $\underline{a} = -4\underline{i} + \underline{j} - 2\underline{k}$, $\underline{b} = 2\underline{i} + \underline{j} + \underline{k}$	xii	Find volume of the parallelepiped determined by; $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$; $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$; $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$
xiii	A force $\underline{F} = 4\underline{i} - 3\underline{k}$, passes through the point $A(2, -2, 5)$. Find the moment of \underline{F} about the point $B(1, -3, 1)$		

SECTION - II

Note:-

Attempt any three questions from this section.

All questions carry equal Marks.

(10x3=30)

5	(a)	Evaluate $\lim_{\theta \rightarrow 0} \frac{\tan \theta - \sin \theta}{\sin^3 \theta}$	(05)
	(b)	If $x = a \cos^3 \theta$, $y = b \sin^3 \theta$ then show that $a \frac{dy}{dx} + b \tan \theta = 0$	(05)
6	(a)	Show that $\int \sqrt{a^2 - x^2} dx = \frac{a^2}{2} \sin^{-1} \frac{x}{a} + \frac{x}{2} \sqrt{a^2 - x^2} + c$	(05)
	(b)	Find h such that the points $A(h, 1), B(2, 7)$ and $C(-6, -7)$ are vertices of a right triangle with right angle at the vertex A.	(05)
7	(a)	Evaluate $\int_0^{\frac{\pi}{4}} \frac{1}{1 + \sin x} dx$	(05)
	(b)	Graph the feasible region of system of linear inequalities. Also find corner points. $2x - 3y \leq 6$ $2x + 3y \leq 12$ $x \geq 0, y \geq 0$	(05)
8	(a)	Find the volume of Tetrahedron with vertices. $(0, 1, 2), (3, 2, 1), (1, 2, 1)$ and $(5, 5, 6)$	(05)
	(b)	Write an equation of circle passing through the points $A(5, 6), B(-3, 2), C(3, -4)$	(05)
9	(a)	Find the point on the curve $y = x^2 - 1$ that is closest to the point $(3, -1)$	(05)
	(b)	Write an equation of the parabola with given elements. Axis parallel to y-axis, the points $(0, 3), (3, 4)$ and $(4, 11)$ lie on the graph.	(05)

(The End)