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

(Academic Sessions 2018 – 2020 to 2020 – 2022)

MATHEMATICS 222-(INTER PART – II) Time Allowed : 30 Minutes

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

PAPER CODE = 8192

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. LHR-G)-22

1-1	If the degree of a polynomial function is 1, then it is called : (A) Identity function (B) Linear function (C) Constant function (D) Trigonometric function
2	$\lim_{x\to 1}\frac{x^2-1}{x^2-x} =$: (A) 2 (B) $\frac{1}{2}$ (C) 4 (D) 5
3	If $y=\frac{1}{x^2}$, then $\frac{dy}{dx}$ at $x=-1$ is : (A) 2 (B) 3 (C) $\frac{1}{3}$ (D) 4
4	$\frac{d}{dx}(\cot^{-1}x) =$: (A) $\frac{1}{1+x^2}$ (B) $\frac{-1}{1+x^2}$ (C) $-\cos ec^2 x$ (D) $\sec^2 x$
5	Two positive integer whose sum is 30 and their product will be maximum are : (A) 14 , 16 (B) 15 , 15 (C) 10 , 20 (D) 12 , 18
6	$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] =$: (A) $\frac{f(x)g'(x)-f'(x)g(x)}{[g(x)]^2}$ (B) $\frac{f'(x)g(x)-f(x)g'(x)}{[f(x)]^2}$ (C) $\frac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$ (D) $\frac{g'(x)f(x)-g(x)f(x)}{[g(x)]^2}$
7	$\int \sec x\,dx =$: (A) $\ell n(\sec x+\tan x)+c$ (B) $\ell n(\cos ec\,x+\cot x)+c$ (C) $\ell n(\sin x+\cos x)+c$ (D) $\sec x+\tan x+c$
8	The solution of differential equation $\frac{dy}{dx}=-y$ is : (A) $y=xe^{-x}$ (B) $y=ce^{-x}$ (C) $y=e^x$ (D) $y=ce^x$
9	$\int_{-1}^{3} x^3dx =$: (A) 20 (B) 40 (C) 30 (D) 60

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10	$\int \sin 3x\,dx =$: (A) $-\frac{\cos 3x}{3}+c$ (B) $\frac{\cos 3x}{3}+c$ (C) $3\cos 3x+c$ (D) $-3\cos 3x+c$
11	An equation of the horizontal line through the point P (7 , – 9) is : (A) $y=-9$ (B) $y=9$ (C) $x=7$ (D) $x=-7$
12	The perpendicular distance of line $3x+4y+10=0$ from the origin is : (A) 0 (B) 1 (C) 2 (D) 3
13	Slope of line perpendicular to line $3x-4y+5=0$ is : (A) $\frac{-3}{4}$ (B) $\frac{-4}{3}$ (C) $\frac{3}{4}$ (D) $\frac{4}{3}$
14	Point of intersection of lines $x-2y+1=0$ and $2x-y+2=0$ equals : (A) (1 , 0) (B) (0 , 1) (C) (– 1 , 0) (D) (0 , – 1)
15	(0 , 0) is the solution of inequality : (A) $7x+2y>3$ (B) $x-3y>0$ (C) $x+2y<6$ (D) $x-3y<0$
16	The condition for a line $y=mx+c$ to be the tangent to the circle $x^2+y^2=a^2$ is : (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) $c=\pm m\sqrt{1-a^2}$
17	In an ellipse, the foci lie on : (A) Major axis (B) Minor axis (C) Directrix (D) Z-axis
18	The radius of the circle $x^2+y^2+2gx+2fy+c=0$ is : (A) $\sqrt{g^2+f^2+c}$ (B) $\sqrt{g^2-f^2+c}$ (C) $g+f-c$ (D) $\sqrt{g^2+f^2-c}$
19	Length of the vector $2\hat{i}-\hat{j}+2\hat{k}$ is : (A) 6 (B) 4 (C) 3 (D) 5
20	Cosine of the angle between two non-zero vectors $\underline{a}$ and $\underline{b}$ is : (A) $\underline{a}\,.\,\underline{b}$ (B) $\frac{\lvert\underline{a}\rvert\lvert\underline{b}\rvert}{\underline{a}\,.\,\underline{b}}$ (C) $\frac{\underline{a}\,.\,\underline{b}}{\lvert\underline{a}\rvert\lvert\underline{b}\rvert}$ (D) $\frac{\underline{a}\times\underline{b}}{\lvert\underline{a}\rvert\lvert\underline{b}\rvert}$

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MATHEMATICS 222-(INTER PART – II) Time Allowed : 2.30 hours

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

SECTION – I

2. Write short answers to any EIGHT (8) questions : CHR-9K22 **16**

(i) Express perimeter " P" of a square as a function of its area " A"

(ii) Find $f^{-1}(x)$ for $f(x) = -2x + 8$

(iii) Evaluate $\lim_{x \to 0} \frac{\sin x^\circ}{x}$

(iv) Define rational function with example.

(v) Evaluate $\lim_{x \to \infty} \left(\frac{x}{1+x} \right)^x$

(vi) Find $\frac{dy}{dx}$ from first principle if $y = \sqrt{x+2}$

(vii) Differentiate w.r.t. " x "; $y = \frac{x^2+1}{x^2-3}$

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

(ix) Find derivative w.r.t. x if $y = \cot^{-1}\left(\frac{x}{a}\right)$

(x) Find $\frac{dy}{dx}$ if $y = \log_{10}(ax^2 + bx + c)$

(xi) Apply the Maclaurin Series to prove that $e^{2x} = 1 + 2x + \frac{4x^2}{\lfloor 2} + \frac{8x^3}{\lfloor 3} + ----$

(xii) Define increasing function with example.

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

(i) Find δy and dy in $y = \sqrt{x}$, when x changes from 4 to 4.41

(ii) Evaluate the integral $\int \frac{(\sqrt{\theta} - 1)^2}{\sqrt{\theta}} d\theta$, $\theta > 0$

(iii) Find $\int \frac{1}{x(\ell n x)} dx$

(iv) Evaluate the integral $\int \frac{x+2}{\sqrt{x+3}} dx$

(v) Using by part method to evaluate $\int x^2 \ell n x \, dx$

(vi) Evaluate the definite integral $\int_0^{\frac{\pi}{3}} \cos^2\theta \sin\theta \, d\theta$

(vii) Find the area between the x-axis and the curve $y = \cos\frac{1}{2}x$ from $x = -\pi$ to π

(viii) Solve the differential equation $\sin y \cos ec\, x \frac{dy}{dx} = 1$

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

(Turn Over)

3. (x) Two points $P(-5,-3)$ and $O'(-2,-6)$ are given in XY-coordinate, find the coordinate of P in xy-coordinate system.

(xi) Find equation of the line having x-intercept -3 and y-intercept 4.

(xii) Find the distance from the point P $(6,-1)$ to the line $6x-4y+9=0$

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

(i) Define problem constraint.

(ii) Graph the solution set of the linear inequality $3y-4\leq 0$

(iii) Find slope of tangent to $x^2+y^2=5$ at $(4,3)$

(iv) Find α if $\underline{u}=\alpha\underline{i}+2\alpha\underline{j}-\underline{k}$ and $\underline{v}=\underline{i}+\alpha\underline{j}+3\underline{k}$ are perpendicular to each other.

(v) Find the direction cosine of the vector $\overline{PQ}$, where P $(2,1,5)$ and Q $(1,3,1)$

(vi) Find the vector from point A to origin where $\overline{AB}=4\underline{i}-2\underline{j}$ and B is the point $(-2,5)$

(vii) Find cosine of the angle between $\underline{u}=[-3,5]$ and $\underline{v}=[6,-2]$

(viii) Write standard equation of the hyperbola.

(ix) Find the centre of the ellipse $9x^2+y^2=18$

(x) Find the equation of the circle with centre $(5,-2)$ and radius is 4.

(xi) Find the equation of the hyperbola with foci $(\pm 5,0)$ and vertex $(3,0)$

(xii) Find centre and radius of the circle $4x^2+4y^2-8x+12y-25=0$

(xiii) Find focus and vertex of the parabola $x^2=5y$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Prove that $\lim\limits_{x\to 0}\dfrac{a^x-1}{x}=\log_e a$ 5

(b) If $x=\dfrac{1-t^2}{1+t^2}$, $y=\dfrac{2t}{1+t^2}$ prove that $y\dfrac{dy}{dx}+x=0$ 5

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

(b) Prove that the linear equation $ax+by+c=0$ in two variables x and y represents a straight line. 5

7. (a) Find the area between the x-axis and the curve $y=\sqrt{2ax-x^2}$ when $a>0$ 5

(b) Graph the solution region of the system of linear inequalities and find the corner points of $2x-3y\leq 6$, $2x+3y\leq 12$, $x\geq 0$ 5

8. (a) Find a joint equation of the lines through the origin and perpendicular to the lines represented by $x^2-2xy\tan\alpha-y^2=0$ 5

(b) Find equations of the tangent lines to the circle $x^2+y^2+4x+2y=0$ drawn from P $(-1,2)$ 5

9. (a) Find the centre, foci, eccentricity, vertices and equations of directrices of $\dfrac{y^2}{16}-\dfrac{x^2}{9}=1$ 5

(b) Prove that $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$ 5