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

(Academic Sessions 2018 – 2020 to 2020 – 2022)

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 : **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 $e^{2x}=1+2x+\frac{4x^2}{\underline{|2}}+\frac{8x^3}{\underline{|3}}+----$

(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 $\int\frac{1}{x(\ell nx)}dx$

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

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

(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 $\sin y\,\text{cosec}\,x\frac{dy}{dx}=1$

(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 $3y-4\le 0$

(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 $\int \ell n(x+\sqrt{x^2+1})\,dx$ 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 $2x-3y\le 6$, $2x+3y\le 12$, $x\ge 0$ 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