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 – I Maximum Marks : 20

PAPER CODE = 8193

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-G1-22

1-1	(0 , 0) is the solution of inequality : (A) $3x-7y<3$ (B) $x+y>2$ (C) $x-y>1$ (D) $3x+5y>7$
2	The slope of a line with inclination 90°`is : (A) 0 (B) – 1 (C) Undefined (D) 1
3	If $\underline{a}$ and $\underline{b}$ are parallel vectors then $\underline{a} \times \underline{b}$ = : (A) $\underline{0}$ (B) – 1 (C) 1 (D) 2
4	Two lines $a_1x+b_1y+c_1=0$, $a_2x+b_2y+c_2=0$ are parallel if : (A) $\frac{a_1}{a_2}=\frac{b_1}{b_2}$ (B) $\frac{a_1}{a_2}=-\frac{b_1}{b_2}$ (C) $\frac{b_1}{c_1}=\frac{b_2}{c_2}$ (D) $\frac{a_1}{c_1}=\frac{a_2}{c_2}$
5	The value of $3\,\underline{j}.\underline{k}\times\underline{i}$ is : (A) – 1 (B) – 3 (C) 3 (D) 0
6	If a straight line is parallel to x-axis, then its slope is : (A) Undefined (B) – 1 (C) 1 (D) 0
7	The centre of the circle $5x^2+5y^2+24x+36y+10=0$ is : (A) $\left(\frac{12}{5},\frac{18}{5}\right)$ (B) $\left(-\frac{12}{5},-\frac{18}{5}\right)$ (C) $\left(\frac{12}{5},-\frac{18}{5}\right)$ (D) $\left(-\frac{12}{5},\frac{18}{5}\right)$
8	The length of the latus rectum of the parabola $y^2=8x$ is : (A) 2 (B) 8 (C) 4 (D) $2\sqrt{8}$
9	The point of intersection of angle bisectors of a triangle is called : (A) Orthocentre (B) Centroid (C) In-centre (D) Circumcentre

(Turn Over)

10	The coordinates of the vertices of hyperbola $\frac{y^2}{16}-\frac{x^2}{49}=1$ are : (A) $(0,\pm 7)$ (B) $(\pm 4,0)$ (C) $(0,\pm 4)$ (D) $(\pm 7,0)$
11	$\frac{d}{dx}(\sin 2x+\cos 2x)=:$ (A) $(\cos 2x-\sin 2x)$ (B) $(\cos 2x+\sin 2x)$ (C) $(2\cos 2x+2\sin 2x)$ (D) $2(\cos 2x-\sin 2x)$
12	$\lim_{h\to 0}(1+2h)^{\frac{1}{h}}=:$ (A) e^2 (B) e (C) $\frac{1}{e}$ (D) $\frac{1}{e^2}$
13	$\int e^{\sin x}\cos x\,dx=:$ (A) $e^{\cos x}+c$ (B) $\ell n\lvert\sin x\rvert+c$ (C) $\ell n\lvert\cos x\rvert+c$ (D) $e^{\sin x}+c$
14	$\frac{d}{dx}(\cot^{-1}x)=:$ (A) $\frac{1}{1+x^2}$ (B) $\frac{1}{1-x^2}$ (C) $-\frac{1}{1+x^2}$ (D) $-\frac{1}{1-x^2}$
15	$\int e^x(\cos x+\sin x)\,dx=:$ (A) $e^{-x}\sin x+c$ (B) $e^x\sin x+c$ (C) $-e^x\sin x+c$ (D) $e^{-x}\cos x+c$
16	If $y=e^{-ax}$ then $\frac{dy}{dx}=:$ (A) ae^{-ax} (B) e^{-ax} (C) a^2e^{-ax} (D) $-ae^{-ax}$
17	$\int\frac{1}{1+x^2}dx=:$ (A) $\tan^{-1}x+c$ (B) $-\tan^{-1}x+c$ (C) $\sin^{-1}x+c$ (D) $\cos^{-1}x+c$
18	The range of $f(x)=\sqrt{x^2-9}$ is : (A) $(-\infty,0]$ (B) $[0,+\infty)$ (C) $(0,+\infty)$ (D) $(-\infty,\infty)$
19	$\int\sin x\cos x\,dx=:$ (A) $\ell n\lvert\sin x\rvert+c$ (B) $\frac{\cos^2 x}{2}+c$ (C) $\frac{\sin^2 x}{2}+c$ (D) $\frac{\sin^2 x\cos^2 x}{2}+c$
20	$\frac{d}{dx}\left(\frac{1}{\operatorname{cosec} x}\right)=:$ (A) $\frac{1}{\sec x}$ (B) $\operatorname{cosec}^2 x$ (C) $\cot x$ (D) $\frac{1}{\operatorname{cosec}^2 x}$

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 – II Maximum Marks : 80

SECTION – I

LHR-92-22

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

(i) Find domain and range of $f(x)=\sqrt{x+1}$

(ii) Find $fof(x)$ if $f(x)=\sqrt{x+1}$

(iii) Obtain $f^{-1}(x)$ from $f(x)=3x^3+7$

(iv) Evaluate $\lim\limits_{\theta\to 0}\dfrac{1-\cos\theta}{\theta}$

(v) Express $\lim\limits_{x\to+\infty}\left(\dfrac{x}{1+x}\right)^x$ in terms of "e"

(vi) If $y=\dfrac{x^2+1}{x^2-3}$, then find $\dfrac{dy}{dx}$

(vii) Prove that derivative of $\tan^{-1}x$ w.r.t. "x" is $\dfrac{1}{1+x^2}$

(viii) Differentiate $\dfrac{1}{a}\sin^{-1}(\dfrac{a}{x})$ w.r.t. "x"

(ix) Find $\dfrac{dy}{dx}$ if $y=x^2\ell n\sqrt{x}$

(x) If $y=e^{-x}(x^3+2x^2+1)$, then find $\dfrac{dy}{dx}$

(xi) Apply the Maclaurin's series expansion to prove that $e^x=1+\dfrac{x}{1!}+\dfrac{x^2}{2!}+\dfrac{x^3}{3!}+----$

(xii) Determine the interval in which $f(x)=\sin x\ , x\in(-\pi,\pi)$ is decreasing.

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

(i) If $x^2+2y^2=16$, find $\dfrac{dy}{dx}$ by using differentials.

(ii) Evaluate $\int\dfrac{x}{x+2}dx$

(iii) Evaluate indefinite integral $\int\dfrac{\sec^2 x}{\sqrt{\tan x}}dx$

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

(v) Evaluate the definite integral $\int_{-1}^{1}(x^{1/3}+1)dx$

(vi) Find the area between the x-axis and the curve $y=x^2+1$ from $x=1$ to $x=2$

(vii) Evaluate $\int e^{-x}(\cos x-\sin x)dx$

(viii) Solve $x\,dy+y(x-1)dx=0$

(ix) Show that the points A (3 , 1) , B (– 2 , – 3) and C (2 , 2) are vertices of an isosceles triangle

3. (x) Find an equation of line having x-intercept $: -9$ and slope $: -4$

(xi) Show that the lines $4x-3y-8=0$, $3x-4y-6=0$ and $x-y-2=0$ are concurrent.

(xii) What is homogeneous equation?

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

(i) Graph the solution set of $2x+1 \geq 0$

(ii) Define problem constraint.

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

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

(v) Check the position of the point $(5, 6)$ with respect to the circle $x^2+y^2=81$

(vi) Find focus and vertex of $y^2=8x$

(vii) Find equation of ellipse with foci $(\pm 3, 0)$ and minor axis of length 10.

(viii) Find equation of hyperbola with centre $(0, 0)$, focus $(6, 0)$, vertex $(4, 0)$

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

(x) Find α so that $\left|\alpha \underline{i}+(\alpha+1)\underline{j}+2\underline{k}\right| = 3$

(xi) Find the cosine of the angle θ between $\underline{u}$ and $\underline{v}$; $\underline{u}=\underline{i}-3\underline{j}+4\underline{k}$; $\underline{v}=4\underline{i}-\underline{j}+3\underline{k}$

(xii) Prove that $\underline{a} \times (\underline{b}+\underline{c}) + \underline{b} \times (\underline{c}+\underline{a}) + \underline{c} \times (\underline{a}+\underline{b}) = 0$

(xiii) A force $\overrightarrow{F}=7\underline{i}+4\underline{j}-3\underline{k}$ is applied at P $(1, -2, 3)$. Find its moment about the point Q $(2, 1, 1)$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Discuss the continuity of $f(x)$ at $x=1$ $f(x) = \begin{cases} 3x-1 & \text{if } x<1 \\ 4 & \text{if } x=1 \\ 4x & \text{if } x>1 \end{cases}$ 5

(b) Show that $2^{x+h} = 2^x \{1+(\ell n\, 2)h+\frac{(\ell n\, 2)^2 h^2}{2!}+\frac{(\ell n\, 2)^3 h^3}{3!}+.....\}$ 5

6. (a) Evaluate $\int \sqrt{4-5x^2}\, dx$ 5

(b) Find the equation of perpendicular bisector of segment joining the points A $(3, 5)$ and B $(9, 8)$ 5

7. (a) Evaluate the integral $\int_0^{\pi/4} \frac{\cos\theta+\sin\theta}{2\cos^2\theta}\, d\theta$ 5

(b) Maximize $f(x, y) = x+3y$ subject to the constraints
$2x+5y \leq 30$; $5x+4y \leq 20$, $x \geq 0$, $y \geq 0$ 5

8. (a) Find the interior angles whose vertices are A $(-2, 11)$, B $(-6, -3)$, C $(4, -9)$ 5

(b) Find an equation of the circle passing through the points A $(4, 5)$, B $(-4, -3)$, C $(8, -3)$ 5

9. (a) Prove angle in a semi circle is right angle. 5

(b) Find an equation of the tangent to the parabola $y^2=-6x$ which is parallel to the line $2x+y+1=0$. Also find point of tangency. 5