LHR-I-21

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

(Academic Sessions 2017 – 2019 to 2019 – 2021)

MATHEMATICS 221-(INTER PART – II) Time Allowed : 30 Minutes

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

PAPER CODE = 8195

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.

1-1	$\int (2x+3)^{\frac{1}{2}}\,dx = :$ (A) $\frac{(2x+3)^{\frac{3}{2}}}{2}+c$ (B) $\frac{1}{3}(2x+3)^{\frac{3}{2}}+c$ (C) $\frac{1}{2}(2x+3)^{\frac{1}{3}}+c$ (D) $\frac{1}{3}(2x+3)^{\frac{-1}{2}}+c$
2	Distance between A (3 , 1) and B (– 2 , – 4) is : (A) $\sqrt{17}$ (B) $5\sqrt{2}$ (C) $\sqrt{26}$ (D) $2\sqrt{5}$
3	If $f(x)=\frac{x}{x^2-4}$ then range of $f(x)$ is : (A) All real number (B) Rational number (C) All negative real number (D) Integer
4	Slope 'm' through $A(x_1,y_1)$ $B(x_2,y_2)$ is : (A) $\frac{x_2-x_1}{y_2-y_1}$ (B) $\frac{x_2+x_1}{y_2-y_1}$ (C) $\frac{y_2-y_1}{x_2-x_1}$ (D) $\frac{y_1-y_2}{x_1+x_2}$
5	$\lim_{x\to 0}\frac{\sin ax}{\sin bx} = :$ (A) $\frac{b}{a}$ (B) a (C) $\frac{a}{b}$ (D) $\frac{1}{b}$
6	$\int (a-2x)^{\frac{3}{2}}\,dx = :$ (A) $\frac{1}{5}(a-2x)^{\frac{5}{2}}+c$ (B) $\frac{1}{5}(a-2x)^{\frac{5}{2}}+c$ (C) $-\frac{1}{5}(a-2x)^{\frac{5}{2}}+c$ (D) $-\frac{3}{5}(a-2x)^{\frac{5}{2}}+c$
7	$\int \sec x\,dx = :$ (A) $\sec x+\tan x$ (B) $\sec^2 x$ (C) $\ln\lvert\sec x-\tan x\rvert$ (D) $\ln\lvert\sec x+\tan x\rvert+c$
8	If $f(x)=\frac{1}{x^m}$ then $f'(x) = :$ (A) $-xm^{-1}$ (B) $-mx^{-m-1}$ (C) $-mx^{-m+1}$ (D) $-m^{-1}x$

(Turn Over)

1-9	Midpoint of the line segment joining A (3, 1) and B (– 2 , – 4) is : (A) $\left(\frac{1}{2},-\frac{3}{2}\right)$ (B) $\left(\frac{5}{2},\frac{5}{2}\right)$ (C) $\left(\frac{1}{2},\frac{3}{2}\right)$ (D) $\left(\frac{1}{2},\frac{5}{2}\right)$
10	The derivative of $\frac{1}{1+x}$ is : (A) x (B) $1+x$ (C) $(1+x)^{-2}$ (D) $-1(1+x)^{-2}$
11	In circle $x^2+y^2+2gx+2fy+c=0$, the radius is : (A) $\sqrt{g^2+f^2+c}$ (B) g^2+f^2-c (C) $\sqrt{g^2+f^2-c}$ (D) g^2+f^2+c
12	$x = 5$ is the solution of inequality : (A) $2x-3>0$ (B) $2x+3<0$ (C) $x+4<0$ (D) $x+3<0$
13	In vectors $\vec{a}\times\vec{b}$ = : (A) $\vec{b}\times\vec{a}$ (B) $-\vec{b}\times\vec{a}$ (C) $-\vec{b}$ (D) $-\vec{a}\times\vec{b}$
14	In equation of circle $x^2+y^2=r^2$ the centre of circle is : (A) (x , y) (B) (0 , 0) (C) (1 , 0) (D) (0 , r)
15	Magnitude of vector $\vec{u}=2i-7j$ is : (A) $\sqrt{53}$ (B) $\sqrt{55}$ (C) $\sqrt{48}$ (D) $\sqrt{52}$
16	$\frac{d}{dx}(\cos^{-1}x)$ = : (A) $\frac{1}{\sqrt{1-x^2}}$ (B) $\frac{-1}{\sqrt{1-x^2}}$ (C) $\frac{1}{\sqrt{1+x^2}}$ (D) $\frac{1}{1+x^2}$
17	$1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+---$ is Maclaurin series for : (A) e^x (B) $\sqrt{1+x}$ (C) $\cos x$ (D) $\sin x$
18	The vector $\overrightarrow{PQ}$ through P (0 , 5) and Q (– 1 , – 6) is : (A) [– 1 , 11] (B) [– 1 , – 11] (C) [0 , 11] (D) [1 , 1]
19	$\frac{d}{dx}\tan^{-1}x$ = : (A) $\frac{1}{1-x^2}$ (B) $\frac{1}{\sqrt{1-x^2}}$ (C) $\frac{1}{\sqrt{1+x^2}}$ (D) $\frac{1}{1+x^2}$
20	The focus of parabola $y^2=4ax$ is : (A) (0 , a) (B) (– a , 0) (C) (a , 0) (D) (0 , – a)

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(Academic Sessions 2017 – 2019 to 2019 – 2021)

MATHEMATICS 221-(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) Find the domain and range of the function g defined by : $g(x)=\sqrt{x^2-4}$

(ii) The real valued functions f and g are given. Find fog (x), if

$f(x)=3x^4-2x^2$ and $g(x)=\frac{2}{\sqrt{x}}$, $x\neq 0$

(iii) Evaluate $\lim\limits_{\theta\to 0}\frac{1-\cos\theta}{\theta}$

(iv) Evaluate $\lim\limits_{x\to 1}\frac{x^3-3x^2+2x-1}{x^3-x}$

(v) Find $\frac{dy}{dx}$ if $x^2-4xy-5y=0$

(vi) Differentiate w.r.t. 'x' $\cot^{-1}(\frac{x}{a})$

(vii) Find $f'(x)$ if $f(x)=\sqrt{\ell n(e^{2x}+e^{-2x})}$

(viii) Find y_2 if $x^3-y^3=a^3$

(ix) Prove that $\frac{d}{dx}(\operatorname{cosec}^{-1}x)=\frac{-1}{|x|\sqrt{x^2-1}}$

(x) Differentiate $\frac{2x-1}{\sqrt{x^2+1}}$

(xi) Find the interval in which function is increasing or decreasing :

$f(x)=\cos x \qquad x\in\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$

(xii) Find y_4 if $y=\sin 3x$

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

(i) Use differentials to approximate the value of $\sqrt[4]{17}$

(ii) Solve $\int\frac{dx}{\sqrt{x+1}-\sqrt{x}}$

(iii) Evaluate $\int\frac{\cot\sqrt{x}}{\sqrt{x}}dx$

(iv) Solve $\int\frac{\sec^2 x}{\sqrt{\tan x}}dx$

(v) Solve $\int e^{2x}[-\sin x+2\cos x]dx$

(vi) Evaluate $\int_0^{\frac{\pi}{4}}\sec x(\sec x+\tan x)\,dx$

(vii) Solve the differential equation $\frac{1}{x}\frac{dy}{dx}=\frac{1}{2}(1+y^2)$

(viii) Evaluate $\int x\,\ell nx\,dx$

(ix) The points A (– 5 , – 2) , B (5 , – 4) are ends of a diameter of a circle. Find centre and radius of it.

(Turn Over)

3. (x) Transform the equation $5x-12y+39=0$ into normal form.
(xi) Find k so that the lines joining A (7 , 3) , B (k , – 6) and C (– 4 , 5), D (– 6 , 4) are parallel.
(xii) Find the lines represented by $2x^2+3xy-5y^2=0$

4. **Write short answers to any NINE (9) questions :** **18**
(i) Graph the inequality $5x-4y \le 20$
(ii) Find the equation of the circle with ends of diameter at (– 3 , 2) and (5 , – 6)
(iii) Find the centre of the circle $4x^2+4y^2-8x+12y-25=0$
(iv) Find the length of the tangent from the point (– 5, 10) to the circle $5x^2+5y^2+14x-12y-10=0$
(v) Find the coordinates of the points of intersection of the line $x+2y=6$ with the circle $x^2+y^2-2x-2y-39=0$
(vi) Find the vertex of the parabola $x^2=4(y-1)$
(vii) Find the foci of the hyperbola $\frac{y^2}{16}-\frac{x^2}{9}=1$
(viii) Find a unit vector in the direction of $\underline{v}=-\frac{\sqrt{3}}{2}\underline{i}-\frac{1}{2}\underline{j}$
(ix) Find a vector whose magnitude is 4 and is parallel to $2\underline{i}-3\underline{j}+6\underline{k}$
(x) If $\underline{v}$ is a vector for which $\underline{v}.\underline{i}=0$, $\underline{v}.\underline{j}=0$ and $\underline{v}.\underline{k}=0$, find $\underline{v}$
(xi) If $\underline{a}+\underline{b}+\underline{c}=0$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$
(xii) Find the volume of parallelepiped for which the vectors $\underline{u}=\underline{i}-4\underline{j}-\underline{k}$, $\underline{v}=\underline{i}-\underline{j}-2\underline{k}$ and $\underline{w}=2\underline{i}-3\underline{j}+\underline{k}$ are three edges.
(xiii) Give a force $\underline{F}=2\underline{i}+\underline{j}-3\underline{k}$ acting at a point A (1 , – 2 , 1). Find the moment of $\underline{F}$ about the point B (2 , 0 , – 2)

SECTION – II

Note : Attempt any THREE questions.

5. (a) Discuss the continuity of $f(x)$ at $x=c$ $f(x)=\begin{cases}3x-1 & \text{if } x<1\\ 4 & \text{if } x=1\\ 2x & \text{if } x>1\end{cases}$, $c=1$ 5

(b) Show that $\frac{dy}{dx}=\frac{y}{x}$ if $\frac{y}{x}=\tan^{-1}\frac{x}{y}$ 5

6. (a) Evaluate $\int x\sin^{-1}x\,dx$ 5

(b) Find the interior angles of the triangle with vertices A (6, 1) , B (2, 7) , C (– 6, – 7) 5

7. (a) Evaluate $\int_0^{\frac{\pi}{4}}\frac{1}{1+\sin x}dx$ 5

(b) Minimize $z=2x+y$ subject to constraints 5
$x+y \ge 3$, $7x+5y \le 35$; $x \ge 0$, $y \ge 0$

8. (a) Prove that in any triangle ABC $b^2=c^2+a^2-2ca\cos B$. 5
(b) Find the length of the chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$ 5

9. (a) If $y=(\cos^{-1}x)^2$ then prove that $(1-x^2)y_2-xy_1-2=0$ 5

(b) Find the points of intersection of the given conic $\frac{x^2}{18}+\frac{y^2}{8}=1$ *and* $\frac{x^2}{3}-\frac{y^2}{3}=1$ 5