LHR-II-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 – II Maximum Marks : 20

PAPER CODE = 8198

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	The derivative of $\frac{1}{1+x}$ is :			
	(A) x	(B) $1+x$	(C) $(1+x)^{-2}$	(D) $-1(1+x)^{-2}$
2	$\int \cos x\,dx =$:			
	(A) $1-\sin^2 x$	(B) $\sqrt{1-\sin^2 x}$	(C) $\sin x$	(D) $-\sin x$
3	$\int_1^2 (x^2+1)\,dx =$:			
	(A) $\frac{10}{3}$	(B) $\frac{3}{10}$	(C) π	(D) $\frac{\pi}{2}$
4	If $y=\cot^{-1}x$, then $\frac{dy}{dx} =$:			
	(A) $\frac{1}{1-x^2}$	(B) $\frac{-1}{1+x^2}$	(C) $\frac{1}{x^2-1}$	(D) $\frac{1}{x^2+1}$
5	The derivative of $\ell n(\tanh x)$ is :			
	(A) $\frac{1}{\tanh x}$	(B) $\frac{\sec h^2 x}{\tanh x}$	(C) $\sec h^2 x$	(D) $\sec hx$
6	$x=at^2$ and $y=2at$ are parametric equations of :			
	(A) Parabola	(B) Ellipse	(C) Circle	(D) Hyperbola
7	If $y^2+x^2=a^2$, then $\frac{dy}{dx} =$:			
	(A) $-\frac{x}{y}$	(B) $-\frac{y}{x}$	(C) $\frac{x}{y}$	(D) $\frac{y}{x}$
8	The order of $\frac{dy}{dx}=\frac{4}{3}x^3+x-3$ is :			
	(A) 1	(B) $\frac{3}{4}$	(C) $\frac{4}{3}$	(D) -3
9	$\int_a^x 3x^2dx =$:			
	(A) x^3+a^3	(B) x^3-a^3	(C) $3x^3$	(D) x^3

(Turn Over)

1-10	If θ is measured in radian then $\lim_{\theta \to 0} \frac{\sin 7\theta}{\theta} =$: (A) 7 (B) $\frac{1}{7}$ (C) $\frac{7\pi}{22}$ (D) $\frac{7\pi}{12}$
11	The measure of the angle between the lines $ax^2 + 2hxy + by^2 = 0$ is given by $\tan\theta =$: (A) $\frac{\sqrt{h^2 - ab}}{a - b}$ (B) $\frac{2\sqrt{h^2 - ab}}{a + b}$ (C) $\frac{h^2 - ab}{a + b}$ (D) ∞
12	If $\vec{a} = \hat{i} - \hat{j}$ and $\vec{b} = \hat{j} + \hat{k}$ then $\vec{a} \cdot \vec{b} =$: (A) 0 (B) 1 (C) -1 (D) $\sqrt{2}$
13	The feasible solution which maximize or minimize the objective function is called : (A) Boundary (B) Half plane (C) Optimal solution (D) Initial values
14	The value of c for $\frac{y^2}{16} - \frac{x^2}{49} = 1$ is : (A) 16 (B) 49 (C) 65 (D) $\sqrt{65}$
15	The equation of a straight line represented by $x\cos\alpha + y\sin\alpha = P$ is called : (A) Normal form (B) Angular form (C) Symmetric form (D) P – form
16	The unit vector in the direction of $\vec{v} = [3, -4]$: (A) $5[3, -4]$ (B) $\frac{1}{5}[3, -4]$ (C) $\hat{i}$ (D) $\hat{j}$
17	The points A $(-5, -2)$, B $(5, -4)$ are ends point of a diameter of the circle. The centre will be : (A) $(0, 3)$ (B) $(0, -3)$ (C) $(5, 2)$ (D) $(-5, 4)$
18	$xy = 0$ represents : (A) A pair of lines (B) Hyperbola (C) Parabola (D) Ellipse
19	The projection of $\vec{v}$ along $\vec{u}$ is : (A) $\frac{\vec{u} \cdot \vec{v}}{\lvert u \rvert}$ (B) $\frac{\vec{u} \cdot \vec{v}}{\lvert v \rvert}$ (C) $\frac{\vec{u} \cdot \vec{v}}{\lvert u \rvert \lvert v \rvert}$ (D) $\frac{\vec{u} \cdot \vec{v}}{\lvert u \rvert + \lvert v \rvert}$
20	An angle inscribed in a semi-circle is : (A) 0 (B) $\frac{\pi}{2}$ (C) π (D) 2π

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MATHEMATICS 221-(INTER PART – II)

PAPER – II (Essay Type) GROUP – II

Time Allowed : 2.30 hours

Maximum Marks : 80

SECTION – I

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

(i) Express the area A of a circle as a function of its circumference C.

(ii) For the real-valued function $f(x)=\frac{2x+1}{2x-1}$, $x>1$. Find $f^{-1}(x)$

(iii) Evaluate $\lim_{x\to 3}\frac{x-3}{\sqrt{x}-\sqrt{3}}$

(iv) Find the domain and range of $g(x)=|x-3|$

(v) If $y=\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$, find $\frac{dy}{dx}$

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

(vii) Differentiate $\sin x$ *w.r.t.* $\cot x$

(viii) Find $\frac{dy}{dx}$ if $y=x^2\ell n\frac{1}{x}$

(ix) Find y_2 if $y=x^2.e^{-x}$

(x) If $y=\ell n(\tanh x)$, find $\frac{dy}{dx}$

(xi) Find $\frac{dy}{dx}$ if $y=(x^2+5)(x^3+7)$

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

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

(i) Use differential to find $\frac{dy}{dx}$ for $xy+x=4$

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

(iii) Evaluate $\int\frac{x+b}{(x^2+2bx+c)^{1/2}}dx$

(iv) Evaluate $\int e^x(\cos x+\sin x)\,dx$

(v) Evaluate $\int\frac{(a-b)x}{(x-a)(x-b)}dx$

(vi) Evaluate $\int_{-1}^{1}(x^{1/3}+1)\,dx$

(vii) Find the area above the x-axis and under the curve $y=5-x^2$ from $x=-1$ to $x=2$

(viii) Solve differential equation $ydx+xdy=0$

(ix) Find mid-point of line segment joining A (– 8 , 3) ; B (2 , – 1)

(x) Two points ' P ' and ' O' ' given in xy-coordinate system. Find XY-coordinates of ' P ' referred to translated axis $O'X$ and $O'Y$ for P (– 2 , 6) ; O' (– 3 , 2)

(xi) Find equation of the line joining (– 5 , – 3) and (9 , – 1)

(xii) Find equation of vertical line through (– 5 , 3)

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

(i) Graph the solution set of given linear inequality in xy-plane : $2x + y \leq 6$

(ii) Find the centre and radius of the circle with the given equation
$5x^2 + 5y^2 + 14x + 12y - 10 = 0$

(iii) Find the focus and vertex of the parabola $x^2 = -16y$

(iv) Write an equation of parabola with given elements : Focus $(-3, 1)$; directrix $x - 2y - 3 = 0$

(v) Find an equation of directrices of given hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$

(vi) Find the centre and eccentricity of given hyperbola $\frac{y^2}{16} - \frac{x^2}{9} = 1$

(vii) Find the unit vector in the same direction as the vector $\underline{v} = [3, -4]$

(viii) Find the constant a so that the vectors $\underline{v} = \underline{i} - 3\underline{j} + 4\underline{k}$ and $\underline{w} = a\underline{i} + 9\underline{j} - 12\underline{k}$ are parallel.

(ix) Find a vector of length 2 in the direction opposite that of $\underline{v} = -\underline{i} + \underline{j} + \underline{k}$

(x) Find the cosine of the angle θ between $\underline{u}$ and $\underline{v}$ $\underline{u} = [2, -3, 1]$ and $\underline{v} = [2, 4, 1]$

(xi) Compute $\underline{b} \times \underline{a}$. Check your answer by showing that $\underline{b}$ is perpendicular to $\underline{b} \times \underline{a}$: $\underline{a} = 2\underline{i} + \underline{j} - \underline{k}$; $\underline{b} = \underline{i} - \underline{j} + \underline{k}$.

(xii) If $\underline{a} + \underline{b} + \underline{c} = 0$, then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$

(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) Find value of k, if the function $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & x \neq 2 \\ k, & x = 2 \end{cases}$ 5

is continuous at $x = 2$

(b) If $y = \tan(p \tan^{-1} x)$ then show that $(1+x^2)y_1 - p(1+y^2) = 0$ 5

6. (a) Evaluate $\int \frac{\sqrt{2}}{\sin x + \cos x} dx$ 5

(b) Find an equation of the line through the intersection of the lines $x - y - 4 = 0$ and $7x + y + 20 = 0$ and parallel to the line $6x + y - 14 = 0$ 5

7. (a) Find the area bounded by the curve $y = x^3 - 4x$ and the x-axis. 5

(b) Maximize $f(x, y) = 2x + 5y$ subject to the constraints 5

$2y - x \leq 8$, $x - y \leq 4$, $x \geq 0$, $y \geq 0$

8. (a) Write equation of the circle passing through the points A $(-7, 7)$, B $(5, -1)$ and C $(10, 0)$ 5

(b) Find a vector of length 5 in the direction opposite that of $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$ 5

9. (a) Show that $y = \frac{\ell nx}{x}$ has maximum value at $x = e$ 5

(b) Find focus, vertex and directrix of parabola $x^2 - 4x - 8y + 4 = 0$ 5