Note : Four choices A , B , C ,D to each question are given. Which choice is correct fill that circle in front of that Question No. on the Objective Bubble Sheet. Use Marker or Pen to fill the circles. Cutting or filling two or more circles will result in Zero Mark in that Question.

Q.No	
1 (1)	$\lim_{x \to a} \dfrac{f(x) - f(a)}{x - a}$ is equal to : (A) f'(x) (B) f'(0) (C) f'(a) (D) f'(2)
(2)	$\dfrac{e^{2x} - 1}{2e^x}$ = : (A) Sinx (B) Cos x (C) Sinhx (D) Coshx
(3)	A function of the form f (x , y) = 0 is called : (A) Parametric Function (B) Identity Function (C) Explicit Function (D) Implicit Function
(4)	$\dfrac{d}{dx}\left(\dfrac{1}{ax+b}\right)$ is equal to : (A) $\dfrac{1}{(ax+b)^2}$ (B) $\dfrac{-a}{(ax+b)^2}$ (C) $\dfrac{a}{(ax+b)^2}$ (D) ln (ax + b)
(5)	For n ≠ −1 , $\int x^n dx$ = : (A) $\dfrac{x^{n-1}}{n-1} + C$ (B) $x^{n+1} + C$ (C) $\dfrac{x^{n+1}}{n+1} + C$ (D) $\dfrac{x^n}{n+1} + C$
(6)	Derivative of Sinh^{-1}x with respect to x is : (A) $\dfrac{1}{\sqrt{1-x^2}}$ (B) $\dfrac{1}{\sqrt{1+x^2}}$ (C) $\dfrac{-1}{\sqrt{1-x^2}}$ (D) $\dfrac{-1}{\sqrt{1+x^2}}$
(7)	Derivative of Sin^{2}x with respect to Cos^{2}x is : (A) −1 (B) 1 (C) tanx (D) cotx
(8)	$\int Sec^2 nx\,dx$ = : (A) $\dfrac{n}{3}$ sec nx + c (B) n tan nx + c (C) tan nx + c (D) $\dfrac{1}{n}$ tan nx + c
(9)	If Distance of point (5 , x) from x – axis is 3 then x = : (A) 7 (B) 5 (C) 3 (D) −5
(10)	$\int_{-\infty}^{\infty} \dfrac{1}{1+x^2}\,dx$ = : (A) $\dfrac{\pi}{2}$ (B) π (C) $\dfrac{\pi}{4}$ (D) $\dfrac{\pi}{3}$
(11)	When expression $\sqrt{x^2 - a^2}$ involve in integration , we substitute : (A) x = asecθ (B) x = asinθ (C) x = atanθ (D) x = sinθ
(12)	If 'α' is inclination of line 'ℓ' then it must be true that : (A) $0 \le \alpha < \dfrac{\pi}{2}$ (B) $\dfrac{\pi}{2} \le \alpha < \pi$ (C) $0 \le \alpha \le 2\pi$ (D) $0 < \alpha < \pi$
(13)	Axis of Parabola x^2 = 4ay is : (A) y = 0 (B) x = y (C) x = 0 (D) y = −x
(14)	A Feasible Solution which maximize or minimize the objective function is called : (A) Solution (B) Optimal Solution (C) Minimum Solution (D) Maximum Solution
(15)	If lines are parallel then point of intersections are : (A) Does not exist (B) Finite (C) Infinite (D) Both B and C
(16)	Length of major and minor axis of ellipse x^2 + 16y^2 = 16 is : (A) 4 , 1 (B) 10 , 5 (C) 16 , 2 (D) 8 , 2
(17)	$\|\underline{a} \times \underline{b}\|$ = : (A) Area of Triangle (B) Area of Circle (C) Area of Parallelogram (D) Area of Trapezium
(18)	Direction Cosines of y – axis are : (A) (1 , 0 , 0) (B) (0 , 1 , 0) (C) (0 , 0 , 1) (D) (0 , 0 , 0)
(19)	If eccentricity e > 1 then the conic is : (A) Hyperbola (B) Ellipse (C) Circle (D) Parabola
(20)	Projection of Vector $\underline{r}$ = a$\hat{i}$ + b$\hat{j}$ + c$\hat{k}$ on x – axis is : (A) a (B) b (C) c (D) $\sqrt{a^2 + b^2 + c^2}$

Note : Four possible choices A , B , C ,D to each question are given. Which choice is correct fill that circle in front of that Question No. Use Marker or Pen to fill the circles. Cutting or filling two or more circles will result in Zero Mark in that Question.

Bwp-12-23

Q.No.		
1 (1)	Length of Vector $2i - j - 2k$ is : (A) 3 (B) –3 (C) $\sqrt{5}$ (D) $-\sqrt{5}$	
(2)	$|Cos\alpha i + Sin\alpha j + 0K| = $: (A) 0 (B) 1 (C) 2 (D) – 1	
(3)	The vertices of Hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$ is : (A) $(0, \pm 3)$ (B) $(\pm 3, 0)$ (C) $(0, \pm 2)$ (D) $(\pm 2, 0)$	
(4)	Co–Vertices of Ellipse $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$; (a > b) are : (A) $(0, \pm a)$ (B) $(\pm a, 0)$ (C) $(0, \pm b)$ (D) $(\pm b, 0)$	
(5)	Focus of the Parabola $x^2 = -16y$ is : (A) $(0, 4)$ (B) $(0, -4)$ (C) $(4, 0)$ (D) $(-4, 0)$	
(6)	Length of Tangent from (1 , 1) to circle $x^2 + y^2 - 2x + 3y + 6 = 0$: (A) 1 (B) 2 (C) 3 (D) 4	
(7)	(0 , 0) is not a solution of the inequality : (A) $x - y < 1$ (B) $2x + y < 1$ (C) $-2x + y + 1 > 0$ (D) $-2x + y < -1$	
(8)	Equation of Horizontal Line through (a , b) is : (A) $x = a$ (B) $x = b$ (C) $y = a$ (D) $y = b$	
(9)	Slope of line with inclination 45° is : (A) 1 (B) 0 (C) $\frac{1}{\sqrt{2}}$ (D) $\frac{1}{\sqrt{3}}$	
(10)	The equation of line $\frac{x}{PSec\alpha} + \frac{y}{PCosec\alpha} = 1$ is called : (A) Symmetric Form (B) Intercept Form (C) Normal Form (D) Slope Intercept Form	
(11)	The solution of differential equation $xdy + ydx = 0$: (A) $y = lnx + c$ (B) $y = ln(cx)$ (C) $y = ce^x$ (D) $xy = a$	
(12)	$\int e^{-x} (Cosx - Sinx)dx = $ (A) $e^{-x} Sinx + C$ (B) $e^{-x} Cosx + C$ (C) $-e^{-x} Sinx + C$ (D) $-e^{-x} Cosx + C$	
(13)	$\int_{-\pi}^{\pi} Sinxdx = $: (A) 1 (B) –1 (C) 2 (D) 0	
(14)	$\int \frac{dx}{xlnx} = $ (A) $lnx + C$ (B) $\frac{1}{x} + c$ (C) $ln(lnx) + C$ (D) $\frac{(lnx)^2}{2} + c$	
(15)	If $f(x) = Sinx$ then $f'(\frac{\pi}{2}) = $ (A) – 1 (B) 0 (C) 1 (D) ∞	
(16)	$\sqrt{1 - x^2} \frac{d}{dx}(Cos^{-1}x + Sin^{-1}x) = $ (A) 0 (B) 1 (C) $\frac{1}{\sqrt{1-x^2}}$ (D) $\frac{+2}{\sqrt{1-x^2}}$	
(17)	$\frac{d}{dx}(e^x - e^{-x}) = $: (A) Sinhx (B) Coshx (C) 2 Sinhx (D) 2 Coshx	
(18)	The derivative of $\frac{x^2 - 4}{x + 2}$ is equal to : (A) – 2 (B) 2 (C) 1 (D) 0	
(19)	$Lim_{x \to \infty} \frac{x + e}{x - e} = $: (A) 0 (B) ∞ (C) 1 (D) – 1	
(20)	A function $f : x \to y$ defined by $f(x) = a$ is called : (A) Linear Function (B) Constant Function (C) Identity Function (D) Implicit Function	

Note: It is compulsory to attempt any(8 – 8) Parts each from Q.No. 2 and Q.No.3 while attempt any (9) Parts from Q.No.4. Attempt any (3) Questions from Part – II .Write same Question No. and its Part No. as given in the Question Paper.

| | Part - I | βωρ↑2-23 | 25 x 2 = 50 |

Q.No.2	(i)	Define Even Function and give one example.		
	(ii)	Without finding Inverse , state Domain and Range of f^{-1} where $f(x) = 2 + \sqrt{x-1}$		
	(iii)	Indicate Solution Region by shading the Inequality $3x + 7y \geq 21$		
	(iv)	Evaluate $\lim_{x \to 0} \dfrac{1 - Cos2x}{x^2}$	(v)	Find Derivative of $\sqrt{x}$ by definition.
	(vi)	Differentiate $\dfrac{(x^2+1)^2}{x^2-1}$ w.r.t. x	(vii)	Find $\dfrac{dy}{dx}$ if $x^2 - 4xy - 5y = 0$
	(viii)	Differentiate $Cos\sqrt{x} + \sqrt{Sinx}$ w.r.t.' x ''	(ix)	If $f(x) = \ln(\sqrt{e^{2x} + e^{-2x}})$ then find $f'(x)$.
	(x)	If $y = Sinh^{-1}\dfrac{x}{2}$ then find $\dfrac{dy}{dx}$	(xi)	If $x = at^2$, $y = bt^4$, then find y_2
	(xii)	Define Feasible Region and Feasible Solution.		
Q.No.3	(i)	Evaluate $\int \dfrac{ax+b}{ax^2+2bx+c}\,dx$	(ii)	Evaluate $\int \sqrt{1+Sinx}\,dx$
	(iii)	Evaluate $\int e^x(Cosx - Sinx)dx$	(iv)	Evaluate $\int \dfrac{1}{x\,lnx}\,dx$
	(v)	Evaluate $\int_{-1}^{3}(x^3 + 3x^2)\,dx$	(vi)	Evaluate $\int_{0}^{3}\dfrac{dx}{x^2+9}$
	(vii)	Find the Integral $\int \dfrac{ax}{\sqrt{a^2-x^4}}\,dx$		
	(viii)	Find Direction Cosine of $\underline{r} = x\hat{i} + y\hat{j} + z\hat{k}$		
	(ix)	Find a vector of length 5 in the direction opposite that of $\underline{v} = \hat{i} - 2\hat{j} + 3\hat{k}$		
	(x)	If $\underline{a}+\underline{b}+\underline{c} = 0$, then prove $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$		
	(xi)	Find α so that $\alpha\hat{i} + \hat{j}$, $\hat{i}+\hat{j}+3\hat{k}$ and $2\hat{i}+\hat{j}-2\hat{k}$ are Coplaner.		
	(xii)	Find the volume of Parallelepiped for $\underline{u} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\underline{v} = 2\hat{i} - \hat{j} - \hat{k}$, $\underline{w} = \hat{j} + \hat{k}$		
Q.No.4	(i)	The Coordinates of a point P are $(-2,6)$. The axes are translated through the point $O'(-3,2)$. Find the Coordinates of Point P referred to new axes.		
	(ii)	By means of slopes show that the points $A(-4,6)$, $B(3,8)$, $C(10,10)$ lie on the same line.		
	(iii)	Find the equation of Horizontal Line through $(7,-9)$		
	(iv)	Find the distance between the parallel lines $3x - 4y + 3 = 0$, $3x - 4y + 7 = 0$		
	(v)	Whether point $P(5,8)$ lies above or below the line $2x - 3y + 6 = 0$		
	(vi)	Find the Area of a Triangular Region whose vertices are $A(5,3)$, $B(-2,2)$, $C(4,2)$		
	(vii)	Find the lines represented by $9x^2 + 24xy + 16y^2 = 0$		
	(viii)	Find the equation of a Circle centre at $(5,-2)$ and Radius is 4		

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Bwp–12–23

	(ix)	Find the equation of Normal to the Circle $x^2 + y^2 = 25$ at $(5\cos\theta, 5\sin\theta)$
	(x)	Find the length of Tangent drawn from $(-5, 4)$ to the Circle $5x^2 + 5y^2 - 10x + 15y - 131 = 0$
	(xi)	Find the Equation of Parabola with Focus $(2, 2)$ and Directrix is $x = -2$
	(xii)	Find Foci and Vertices of an Ellipse $x^2 + 4y^2 = 16$
	(xiii)	Find the Equation of Hyperbola *with Foci* $(\pm 5, 0)$, *Vertex* $(3, 0)$

(Part – II)   3 x 10 = 30

Q.No.5	(a)	Evaluate the Limit $\lim_{x \to 0} \dfrac{e^{1/x} - 1}{e^{1/x} + 1}$; x < 0	(5)
	(b)	Differentiate w.r.t. x , $Sec^{-1}\left(\dfrac{x^2 + 1}{x^2 - 1}\right)$	(5)
Q.No.6	(a)	Evaluate $\int \dfrac{2x}{1 - \sin x} dx$	(5)
	(b)	Find an Equation of the Perpendicular bisector of the Segment Joining the points $A(3, 5)$ and $B(9, 8)$	(5)
Q.No.7	(a)	Find the area between the x–axis and the curve $y = \sqrt{2ax - x^2}$ When a > 0	(5)
	(b)	Graph the feasible region of the following system of Linear Inequalities and find the Corner Points : $2x + 3y \leq 18$ $x + 4y \leq 12$ $3x + y \leq 12$ $x \geq 0$, $y \geq 0$	(5)
Q.No.8	(a)	If $y = e^x \sin x$, then show that $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} + 2y = 0$	(5)
	(b)	Find an Equation of the Circle passing through $A(3, -1), B(0, 1)$ and having Centre at $4x - 3y - 3 = 0$	(5)
Q.No.9	(a)	Find the Focus, Vertex and Directrix of Parabola. Sketch the graph $x^2 - 4x - 8y + 4 = 0$	(5)
	(b)	By Vector Method, prove that in any Triangle $b^2 = c^2 + a^2 - 2ca \cos B$	(5)

Note : Four possible choices A , B , C ,D to each question are given. Which choice is correct fill that circle in front of that Question No. Use Marker or Pen to fill the circles. Cutting or filling two or more circles will result in Zero Mark in that Question.

BWP-22

Q.No.1		
(1)	$\lim_{n \to \infty} \left(1 - \frac{1}{n}\right)^n =$:	(A) e (B) e^2 (C) e^{-1} (D) $\frac{-1}{e}$
(2)	If $f(x) = \frac{1}{x-1}$ then $f(2) =$	(A) -1 (B) 1 (C) 0 (D) -2
(3)	$\frac{d}{dx}(y^n) =$:	(A) ny^{n-1} (B) ny^{n+1} (C) $ny^{n-1}\frac{dy}{dx}$ (D) $ny^{n-1}\frac{dx}{dy}$
(4)	$\lim_{x \to 0}\left(\frac{e^x - 1}{x}\right) =$:	(A) 1 (B) 0 (C) e (D) ∞
(5)	$\frac{d}{dx}\cot ax =$:	(A) $\csc^2 ax$ (B) $a\csc^2 ax$ (C) $-a\csc^2 ax$ (D) $-a\csc ax$
(6)	$\int 3^{\lambda x} dx =$:	(A) $\frac{3^{\lambda x}}{\ln 3}$ (B) $3^{\lambda x}\ln 3$ (C) $\frac{1}{\lambda}\frac{3^{\lambda x}}{\ln 3}$ (D) $3^{\lambda x}$
(7)	$\int \frac{dx}{a^2 + x^2} =$:	(A) $\frac{1}{a}\tan^{-1}\frac{x}{a} + C$ (B) $\frac{1}{2a}\ln\frac{x-a}{x+a}$ (C) $\frac{1}{2a}\ln\frac{x+a}{x-a}$ (D) $\frac{1}{a}\ln(a^2 + x^2)$
(8)	$\frac{d}{dx}(3^x) =$:	(A) $3^x \ln 3$ (B) 3^x (C) $x 3^{x-1}$ (D) 3^{x+1}
(9)	$\int e^x(\cos x + \sin x)dx =$:	(A) $-e^x \sin x$ (B) $e^x \cos x$ (C) $-e^x \cos x$ (D) $e^x \sin x$
(10)	Slope of the line $ax + by + c = 0$ is :	(A) $\frac{a}{b}$ (B) $\frac{-b}{a}$ (C) $\frac{-a}{b}$ (D) $\frac{a}{c}$
(11)	Distance of the point $(2,3)$ from y-axis is :	(A) 4 (B) 2 (C) -2 (D) 5
(12)	$\int_{-\pi}^{\pi} \sin x\, dx =$:	(A) 0 (B) 9 (C) 1 (D) 2
(13)	Equation of Horizontal Line through $(7,-9)$ is :	(A) $y = -9$ (B) $y = 7$ (C) $x = -9$ (D) $x = 7$
(14)	A Circle is called a point circle if :	(A) $r = 1$ (B) $r = 0$ (C) $r = 2$ (D) $r = 3$
(15)	If m_1 and m_2 are the slopes of two lines, then lines are perpendicular if :	(A) $m_1 m_2 = 0$ (B) $m_1 m_2 + 1 = 0$ (C) $m_1 m_2 + 2 = 0$ (D) $m_1 = m_2$
(16)	The point $(-1,2)$ satisfied the inequality :	(A) $x - y > 4$ (B) $x - y \geq 4$ (C) $x + y < 4$ (D) $x + y > 5$
(17)	The length of Diameter of circle $x^2 + y^2 = 9$ is :	(A) 6 (B) 3 (C) $\sqrt{3}$ (D) 9
(18)	The non-zero vectors $\underline{a}$ and $\underline{b}$ are parallel if $\underline{a} \times \underline{b} =$:	(A) 1 (B) -1 (C) 0 (D) 2
(19)	$\hat{j} \times \hat{k} =$:	(A) $\hat{i}$ (B) $-\hat{i}$ (C) 0 (D) $\hat{k}$
(20)	Eccentricity of an Ellipse is :	(A) $e = 0$ (B) $e > 1$ (C) $0 < e < 1$ (D) $e = 1$

Note: It is compulsory to attempt any(8 – 8)Parts each from Q.No. 2 and Q.No.3 while attempt any (9) Parts from Q.No.4. Attempt any (3) Questions from Part – II .Write same Question No. and its Part No. as given in the Question Paper.

Part - I	Bu^{0}-22		25 x 2 = 50

Q.No.2	(i)	Express the volume **v** of a cube as a function of the area of its base.		
	(ii)	If $f(x) = |x-5|$ then find Left Hand and Right Hand limits of $f(x)$ at $x = 5$		
	(iii)	Find Domain and Range of f^{-1} without finding inverse of $f(x)$ if $f(x) = \frac{x-1}{x-4}$, $x \neq 4$		
	(iv)	Find $f(x)$ if $f(x) = x^2 \ln \frac{1}{x}$	(v)	Find the limit $\text{Lim}_{x \to 0} \frac{1 - Cos2x}{x^2}$
	(vi)	Differentiate $\frac{a+x}{a-x}$ w.r.t. "x"	(vii)	If $x = at^2$ and $y = 2at$ then find $\frac{dy}{dx}$
	(viii)	Find the $\text{Lim}_{x \to 2} \frac{x^3 - 8}{x^2 + x - 6}$	(ix)	If $y^3 + 3ax^2 + x^3 = 0$, then find y_2 .
	(x)	Define Critical Value and Critical Point.	(xi)	Find derivative of $(x^3 + 1)^9$ w.r.t. "x"
	(xii)	Differentiate $\frac{1}{a} Sin^{-1} \frac{a}{x}$ w.r.t. "x"		
Q.No.3	(i)	Use differential to approximate the value of $Cos29^{o}$.		
	(ii)	Find $\delta y \; and \; dy \; of \; y = x^2 - 1$ when x changes from 3 to 3 . 02 .		
	(iii)	Using differentials find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ of $xy - \ln x = c$		
	(iv)	Solve the differential equation $(e^x + e^{-x}) \frac{dy}{dx} = e^x - e^{-x}$		
	(v)	Evaluate $\int \frac{1 - x^2}{1 + x^2} dx$	(vi)	Evaluate $\int \frac{x}{\sqrt{4 + x^2}} dx$
	(vii)	Evaluate $\int_1^2 (x^2 + 1) dx$	(viii)	Evaluate $\int_0^{\pi/3} Cos^2 \theta \, Sin\theta \, d\theta$
	(ix)	Find an equation of line through $(-5, -3), (9, -1)$	(x)	By means of slopes, show that the points $(-1, -3), (1, 5), (2, 9)$ lie on the same line.
	(xi)	Find the distance from the point $P(6, -1)$ to the line $6x - 4y + 9 = 0$	(xii)	Find the lines represented by $2x^2 + 3xy - 5y^2 = 0$
Q.No.4	(i)	Define an Objective Function.		
	(ii)	Graph the solution set of Linear Inequality in xy – plane : $3y - 4 \leq 0$		
	(iii)	Find the equation of circle with centre $(\sqrt{2}, -3\sqrt{3})$ and Radius $2\sqrt{2}$		
	(iv)	Find the Centre and Radius of a circle $x^2 + y^2 + 12x - 10y = 0$		
	(v)	Find the equation of Tangent to the circle $x^2 + y^2 = 25$ at point $(4, 3)$		
	(vi)	Find Focus and Directrix of Parabola $x^2 = 4(y - 1)$		
	(vii)	Find Centre and vertices of the ellipse $9x^2 + y^2 = 18$		
	(viii)	Find the Eccentricity and Foci of Hyperbola $\frac{y^2}{16} - \frac{x^2}{49} = 1$		
	(ix)	Write the vector $\overline{PQ}$ in the form of $x\hat{i} + y\hat{j}$ when $P = (2, 3), Q = (6, -2)$		

P.T.O.

|	(x)	Find α so that $\quad | \alpha\hat{i} + (\alpha + 1)\hat{j} + 2\hat{k} | = 3$	
	(xi)	Find the Direction Cosines of the vector $\vec{v} = 3\hat{i} - \hat{j} + 2\hat{k}$	
	(xii)	Find the Cosine of Angle between $\vec{u} = [2, -3, 1]$, $\vec{v} = [2, 4, 1]$	
	(xiii)	Find the value of $3\hat{j} \cdot \hat{k} \times \hat{i}$	

$$\boxed{\text{(Part – II)}} \qquad \boxed{10 \times 3 = 30}$$

Q.No.5	(a)	Evaluate $\quad \mathbf{Lim}_{x \to 0} \dfrac{x}{tanx}$	(5)
	(b)	If $\quad y = \sqrt{x} - \dfrac{1}{\sqrt{x}}$, show that $\quad 2x\dfrac{dy}{dx} + y = 2\sqrt{x}$	(5)
Q.No.6	(a)	Evaluate $\int e^x \left(\dfrac{1 + Sinx}{1 + Cosx}\right) dx$	(5)
	(b)	Find equations of two parallel lines perpendicular to $2x - y + 3 = 0$ such that the product of the x and y intercepts of each is 3.	(5)
Q.No.7	(a)	Evaluate $\quad \int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \dfrac{Cosx}{Sinx\,(2 + Sinx)} dx$	(5)
	(b)	Minimize $\quad z = 3x + y$; subject to the constraints $3x + 5y \geq 15$; $x + 6y \geq 9$; $x \geq 0$; $y \geq 0$	(5)
Q.No.8	(a)	Find a joint equation of the straight lines through the origin and perpendicular to the lines represented by $x^2 + xy - 6y^2 = 0$	(5)
	(b)	Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touch externally	(5)
Q.No.9	(a)	Find Equations of the Tangents of the Ellipse $\dfrac{x^2}{128} + \dfrac{y^2}{18} = 1$ which are parallel to the line $3x + 8y + 1 = 0$. Also find the points of Contact.	(5)
	(b)	Prove that $\quad Sin(\alpha + \beta) = Sin\,\alpha\,Cos\,\beta + Cos\,\alpha\,Sin\,\beta$	(5)

13-06-2022

Mathematics	(D)	L.K.No. 1312	Paper Code No. 8197
Paper II	(Objective Type)	Inter – A – 2021	Session (2017 -19) to (2020 – 22)
Time :	30 Minutes	Inter (Part II)	

Q.No.1

(1) $\lim_{x \to 3} \sqrt{x^2 + x + 4}$ = :   (A) 4   (B) – 4   (C) 6   (D) 0

(2) $\frac{d}{dx}(\sin^{-1} x)$ = :   (A) $\frac{-1}{\sqrt{1-x^2}}$ (B) $\frac{1}{1+x^2}$ (C) $\frac{-1}{1+x^2}$ (D) $\frac{1}{\sqrt{1-x^2}}$

(3) $\frac{d}{dx}(\sin x)$ = :   (A) $-\cos x$ (B) $\cos x$ (C) $\tan x$ (D) $\sec x$

(4) $\lim_{x \to 0} \frac{\sin ax}{\sin bx}$ = :   (A) $\frac{b}{a}$ (B) 1   (C) $\frac{a}{b}$ (D) $\frac{-a}{b}$

(5) $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} +$ ----- is the Maclaurin's Series Expansion of :

     (A) $\sin x$ (B) $\cos x$ (C) e^x (D) e^{2x}

(6) $\int \frac{1}{x} dx$:   (A) $\frac{x^{-2}}{-2} + c$ (B) $\frac{x^0}{0} + c$ (C) $\frac{1}{x^2} + c$ (D) $\ln x + C$

(7) $\int \tan^2 x \, dx$ = :   (A) $2\tan x + c$ (B) $\tan x - c$ (C) $\tan x + x + c$ (D) $\tan x - x + c$

(8) If $f(x) = a^x$ then $f'(x)$ = :   (A) $a^x \ln a$ (B) a^x (C) $x a^{x-1}$ (D) $\frac{a^x}{\ln a}$

(9) $\int \csc x \, dx$:   (A) $-\csc x \cot x + C$ (B) $\ln(\csc x - \cot x) + C$
     (C) $\ln(\csc x + \cot x) + C$ (D) $\ln(\sec x + \tan x) + C$

(10) Slope of line $2y = x - 7$ is :   (A) $\frac{1}{2}$ (B) 2   (C) $\frac{-1}{2}$ (D) – 2

(11) The distance of the point (2, 3) from y – axis is : (A) 3   (B) 2   (C) – 2   (D) – 3

(12) $\int e^x(\cos x + \sin x) dx$:

     (A) $e^x \sin x + C$ (B) $e^x \cos x + C$ (C) $-e^x \cos x + C$ (D) $-e^x \sin x + C$

(13) Point Slope form of equation of Straight line is :
     (A) $y = mx + c$ (B) $y - y_1 = m(x - x_1)$ (C) $\frac{x}{a} + \frac{y}{b} = 1$ (D) $x\cos\alpha + y\sin\alpha = P$

(14) $\hat{k} \times \hat{j}$:   (A) $\hat{i}$ (B) $-\hat{i}$ (C) 1   (D) 0

(15) If $\underline{u} = 2\underline{i} - \underline{j} + 4\underline{k}$ then $\underline{u} \times \underline{v}$:   (A) 8   (B) 1   (C) – 1   (D) 0

(16) Which of the following is the solution of inequality $x + 2y < 6$:
     (A) (4, 1)   (B) (1, 3)   (C) (3, 3)   (D) (1, 4)

(17) If $\underline{v} = \underline{i} - \underline{j} - \underline{k}$ then $|\underline{v}|$:   (A) $\sqrt{3}$ (B) 3   (C) 9   (D) 1

(18) The equation $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ represents : (A) Hyperbola (B) Circle (C) Parabola (D) Ellipse

(19) The Conic is a Hyperbola if Eccentricity is :   (A) $e = 1$ (B) $0 < e < 1$ (C) $e > 1$ (D) $e = \frac{1}{2}$

(20) Directrix of the Parabola $x^2 = -4ay$ is :   (A) $x = a$ (B) $x = -a$ (C) $y = a$ (D) $y = -a$
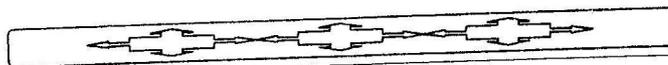
Roll No.	1312 - 24000	Session (2017 –19) to (2020 – 22)	Inter (Part – II)
Mathematics (Subjective)	Inter – A – 2021	Time 2 : 30 Hours Marks : 80	

Note: It is compulsory to attempt any(8 – 8)Parts each from Q No 4 (?)
from Q No.4 ...

Part - 1 $25 \times 2 = 50$

Q.No.2	(i)	Given $f(x) = x^3 - ax^2 + bx + 1$, if $f(2) = -3$ and $f(-1) = 0$ find the values of a and b.		
	(ii)	Evaluate $\lim_{x \to 3} \dfrac{x-3}{\sqrt{x}-\sqrt{3}}$	(iii)	Evaluate $\lim_{x \to 0} \dfrac{1 - Cosx}{Sin^2 x}$
	(iv)	Find $\dfrac{dy}{dx}$ if $y = \dfrac{x}{lnx}$	(v)	Find y_2 if $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}$
	(vi)	Prove that $\dfrac{d}{dx} Sec^{-1}x = \dfrac{1}{|x|\sqrt{x^2-1}}$	(vii)	Differentiate $\dfrac{x^2+1}{x^2-3}$
	(viii)	Find $\acute{f}(x)$ if $f(x) = \ln(\sqrt{e^{2x} + e^{-2x}})$	(ix)	For real valued function f, find $f^{-1}(-1)$ $f(x) = \dfrac{2x+1}{x-1}$ $x > 1$
	(x)	Differentiate w.r.t. 'x' $Sin^{-1}\sqrt{1 - x^2}$	(xi)	Differentiate w.r.t. 'x'; $y = e^{-2x} Sin2x$
	(xii)	If $y = x^4 + 2x^2 + 2$ prove that $\dfrac{dy}{dx} = 4x\sqrt{y-1}$		
Q.No.3	(i)	Find δy of $y = f(x) = x^2$, when $x = 2$ and $dx = 0.01$		
	(ii)	Find the area between the x – axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$		
	(iii)	Show that the points $A(0,2)$, $B(\sqrt{3},-1)$ and $C(0,-2)$ are vertices of right triangle.		
	(iv)	Check whether the point $(5,8)$ lies above or below the line $2x - 3y + 6 = 0$		
	(v)	Evaluate $\int \dfrac{e^x}{e^x+3} dx$	(vi)	Evaluate $\int Sin^2 x\, dx$
	(vii)	Evaluate $\int x\, lnx\, dx$	(viii)	Evaluate $\int_1^2 (x^2 + 1)dx$
	(ix)	Evaluate $\int (2x + 3)^{\frac{1}{2}} dx$	(x)	Solve the Differential Equation $\dfrac{dy}{dx} = \dfrac{1-x}{y}$
	(xi)	Find an equation of vertical line through $(-5,3)$	(xii)	Find the equation of lines represented by $3x^2 + 7xy + 2y^2 = 0$
Q.No.4	(i)	Graph the Solution Set of $2x + y \leq 6$		
	(ii)	Find the Centre and Foci of $\dfrac{x^2}{4} - \dfrac{y^2}{9} = 1$		
	(iii)	Find the Centre and Radius of Circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$		
	(iv)	Write the equation of Tangent and Normal to the circle $x^2 + y^2 = 25$ at $(4,3)$		
	(v)	Find the Focus and Vertex of the Parabola $x^2 = -16y$		
	(vi)	Find point of Intersection of Conics $x^2 + y^2 = 8$ and $x^2 - y^2 = 1$		
	(vii)	Find equation of Parabola if Focus is $(-3,1)$ and Directrix $x = 3$		
	(viii)	Find a Unit Vector in the Direction of $\underline{v} = \dfrac{1}{2}\underline{i} + \dfrac{\sqrt{3}}{2}\underline{j}$		
	(ix)	Find α, so that $|\alpha\underline{i} + (\alpha+1)\underline{j} + 2\underline{k}| = 3$		
	(x)	Find Cosine of angle between the vectors $\underline{u} = [2,-3,1]$ and $\underline{v} = [2,4,1]$		

P.T.O.

	(xi)	Find Area of Parallelogram with vertices $A(1,2,-1)$, $B(4,2,-3)$, $C(6,-5,2)$ and $D(9,-5,0)$	
	(xii)	Find α if $\underline{i}-\underline{j}+\underline{k}$, $\underline{i}-2\underline{j}-3\underline{k}$ and $3\underline{i}-\alpha\underline{j}+5\underline{k}$ are Coplanar.	
	(xiii)	Find the Direction Cosines of $\underline{v}=3\underline{i}-\underline{j}+2k$	

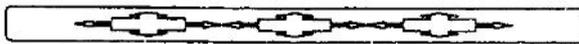## (Part – II)

Q.No.5	(a)	Find values of m and n so that $$f(x)=\begin{cases} mx & \text{if } x<3 \\ n & \text{if } x=3 \\ -2x+9 & \text{if } x>3 \end{cases}$$ is continuous at $x=3$	(5)
	(b)	If $\tan y(1+\tan x)=1-\tan x$, then show that $\dfrac{dy}{dx}=-1$	(5)
Q.No.6	(a)	Find $\int Tan^3x.Secx\,dx$	(5)
	(b)	Find h such that the points $A(h,1)$, $B(2,7)$ and $C(-6,-7)$ are the vertices of a Right Triangle with Right Angle at the Vertex A.	(5)
Q.No.7	(a)	Evaluate $\int_{-1}^{2}(x+|x|)\,dx$	(5)
	(b)	Minimize $z=3x+y$ subject to constraints $3x+5y\geq 15$, $x+6y\geq 9$ $x\geq 0$, $y\geq 0$	(5)
Q.No.8	(a)	Show that the Circles $x^2+y^2+2x-2y-7=0$ and $x^2+y^2-6x+4y+9=0$ touch externally.	(5)
	(b)	Use Vectors Method, prove that in any Triangle ABC, $a^2=b^2+c^2-2bcCosA$	(5)
Q.No.9	(a)	If $y=a\,Cos(lnx)+b\,Sin(lnx)$ prove that $x^2\dfrac{d^2y}{dx^2}+x\dfrac{dy}{dx}+y=0$	(5)
	(b)	A Parabolic Arch has a 100 m base and height 25 m. Find the height of the arch at the point 30 m from the centre of the base.	(5)

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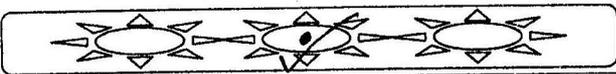
Paper II	(Objective Type)	Inter –A– 2019	Session (2015 -17) to (2017 – 19)
Time :	30 Minutes	Inter (Part II)	
Marks :	20		

Note : Four possible choices A , B , C ,D to each question are given. Which choice is correct fill that circle in front of that Question No. Use Marker or Pen to fill the circles. Cutting or filling two or more circles will result in Zero Mark in that Question.

1 | Projection of $\vec{u} = a\underline{i} + b\underline{j} + c\underline{k}$ along $\underline{i}$ is : (A) b (B) a (C) c (D) a + b

$\underline{K} \times \underline{i}$ equals : (A) $\dot{\underline{J}}$ (B) $\underline{k}$ (C) 1 (D) 0

Slope of tangent to parabola $y^2 = 4ax$ at (a , 2a) is : (A) 3 (B) 2 (C) -1 (D) 1

Focus of the Parabola $x^2 = 4ay$ is : (A) (a , 0) (B) (- a , 0) (C) (0 , a) (D) (0 , - a)

The length of diameter of the circle $x^2 + y^2 - 4x - 12 = 0$ is : (A) 6 (B) 7 (C) 8 (D) 9

The Graph of the Inequality ax + by < c is : (A) Circle (B) Parabola (C) Straight Line (D) Half Plane

The perpendicular distance of the line 3x + 4y + 5 = 0 from the origin is : (A) 0 (B) 1 (C) 2 (D) 5

Equation of the line having slope - 5 and y - intercept - 7 is : (A) 5x + y + 7 = 0 (B) 5x - y + 7 = 0 (C) 5x + y - 7 = 0 (D) 7x + y + 5 = 0

When a line intersects the y – axis at (0 , 4) then y – intercept is : (A) 4 (B) 2 (C) 0 (D) 6

Slope of the Line Perpendicular to line 2x - 3y + 1 = 0 is equal to : (A) $\frac{3}{2}$ (B) $-\frac{3}{2}$ (C) $\frac{2}{3}$ (D) $-\frac{2}{3}$

Solution of Differential Equation $\frac{dy}{dx} = Sec^2 x$ is : (A) y = Cot x + c (B) y = tan x + c (C) y = Cos x + c (D) y = - tan x + c

If $\int_2^K 2 \, dx = 12$, then K = ? : (A) 12 (B) 16 (C) 8 (D) 4

$\int \frac{dx}{\sqrt{5 - x^2}}$ = : (A) $Sin^{-1} \frac{5}{x}$ (B) $sin^{-1} \frac{x}{\sqrt{5}}$ (C) $Sin^{-1} \frac{x}{5}$ (D) $sin^{-1} \frac{\sqrt{5}}{x}$

$\int Sec^2 x \tan x \, dx$ = (A) $Sec\, x \tan^2 x + c$ (B) $\frac{Sec^3 x}{3} + c$ (C) $\frac{Sec^3 x \tan x}{3} + c$ (D) $\frac{\tan^2 x}{2} + c$

If $y = \ln e^x$, then $\frac{dy}{dx}$ = : (A) e^x (B) $\frac{1}{e^x}$ (C) 1 (D) e^{x-1}

The Derivative of x^3 w.r.t. x^2 is equal to : (A) $\frac{3x^2}{2}$ (B) $\frac{3x}{2}$ (C) $\frac{2}{3x}$ (D) $\frac{2}{3x^2}$

$\frac{d}{dx}(2x^2 + 3)^5$ = (A)$(2x^2 + 3)^4 \, 20x$ (B) $20(2x^2 + 3)^5$ (C) $15(2x^2 + 3)^5$ (D) $(2x^2 + 3)^5 \, 100x$

Which one is Leibniz Notation for Derivative of f (x) : (A) $\frac{df}{dx}$ (B) $f'(x)$ (C) $\frac{d}{dx}$ (D) $D f(x)$

$\lim\limits_{x \to -1} \frac{x^3 - x}{x + 1}$ = : (A) 0 (B) ∞ (C) 2 (D) 1

If P is perimeter of square and A is area then P = : (A) $2\sqrt{A}$ (B) 4 A (C) $4\sqrt{A}$ (D) A^2

| Mathematics (Subjective) | Inter – A -2019 | Time 2 : 30 Hours Marks : 80 |

Note : It is compulsory to attempt any (8 – 8) Parts each from Q.No.2 and Q.No.3 while attempt any (9) Parts from Q.No.4. Attempt any (3) Questions from Part – II .Write same Question No. and its Part No. as given in the Question Paper.
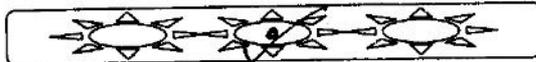
Part - I

25 x 2 = 50

Q.No.2

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

(ii) Define Odd Function and give an example.

(iii) Prove that $\displaystyle\lim_{x \to 0} \frac{\sqrt{x+a} - \sqrt{a}}{x} = \frac{1}{2\sqrt{a}}$

(iv) Find the derivative of $f(x) = c$ by definition.

(v) If $y = x^4 + 2x^2 + 2$ prove that $\frac{dy}{dx} = 4x\sqrt{y-1}$

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

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

(viii) Differentiate $x^2 \sec 4x$ w.r.t. 'x'.

(ix) Find $\frac{dy}{dx}$ if $y = a^{\sqrt{x}}$

(x) Find y_2 if $y = 2x^5 - 3x^4 + 4x^3 + x - 2$

(xi) Find $\frac{dy}{dx}$ if $y = x e^{\sin x}$

(xii) Find $\frac{dy}{dx}$ if $y = \frac{x}{\ln x}$

Q.No.3

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

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

(iii) Graph the solution set of linear inequality $2x + 1 \geq 0$ in xy – plane.

(iv) Using differentials find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ if $xy + x = 4$

(v) Define the Definite Integral.

(vi) Solve the differential equation $y\,dx + x\,dy = 0$

(vii) Evaluate $\int \frac{\cos x}{\sin x \ln \sin x} dx$

(viii) Evaluate $\int x \ln x \, dx$

(ix) Define Corner Point of Solution Region.

(x) Evaluate $\int \sec^4 x \, dx$

(xi) Evaluate $\int_{-2}^{0} \frac{1}{(2x-1)^2} dx$

(xii) Solve $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$

No.4

(i) Show that the points $A(0,2)$, $B(\sqrt{3},-1)$ and $C(0,-2)$ are vertices of a right triangle.

(ii) Find equation of the line through $(-4,7)$ and parallel to $2x - 7y + 4 = 0$

(iii) Find angle from line with slope $\frac{-7}{3}$ to line with slope $\frac{5}{2}$

(iv) Find length of tangent from the point $P(-5,10)$ to circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$

(v) Find Vertex of Parabola $(x-1)^2 = 8(y+2)$

(vi) Find Equation of Hyperbola with Foci $(\pm 4, 0)$, Vertices $(\pm 2, 0)$.

(vii) If $\overrightarrow{AB} = \overrightarrow{CD}$, find A if $B(1,2)$, $C(-2,5)$, $D(4,11)$ are given points.

(viii) If $\underline{u} = \alpha \underline{i} + 2\alpha \underline{j} - \underline{k}$, $\underline{v} = \underline{i} + \alpha \underline{j} + 3\underline{k}$ are perpendicular vectors, find value of α.

(ix) Find vector perpendicular to each of vectors $\underline{a} = 2\underline{i} + \underline{j} + \underline{k}$, $\underline{b} = 4\underline{i} + 2\underline{j} - \underline{k}$

(x) Find volume of parallelepiped determined by :

$$\underline{u} = \underline{i} + 2\underline{j} - \underline{k}, \quad \underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}, \quad \underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$$

(xi) Define Trapezium.

(xii) Define Ellipse.

(xiii) Define Directional Angles.

P.T.O.

.5	(a)	Discuss the continuity of $f(x)$ at $x = 2$ $$f(x) = \begin{cases} x^2 - 1 & x < 2 \\ 3 & x \geq 2 \end{cases}$$	(5)
	(b)	Discuss the function $f(x) = \sin x + \dfrac{1}{2\sqrt{2}} \cos 2x$ for extreme values in the interval $(0, 2\pi)$	(5)
o.6	(a)	Evaluate the Integral $\displaystyle\int \dfrac{2x^2}{(x-1)^2(x+1)} \, dx$	(5)
	(b)	Find the point three – fifth of the way along the line segment from A($-5, 8$) to B($5, 3$)	(5)
lo.7	(a)	Solve the differential equation $\dfrac{dy}{dx} + \dfrac{2xy}{2y+1} = x$	(5)
	(b)	Minimize $z = 3x + y$ Subject to the constraints $3x + 5y \geq 15$ $x + 6y \geq 9$ $x \geq 0, \ y \geq 0$	(5)
No.8	(a)	Find a joint equation of the lines through the origin and perpendicular to the lines $x^2 - 2xy \tan\alpha - y^2 = 0$	(5)
	(b)	Find equation of the circle of radius 2 and tangent to the line $x - y - 4 = 0$ at A($1, -3$)	(5)
No.9	(a)	Find the Centre, Foci, Eccentricity, Vertices and equations of diretrices of : $\dfrac{x^2}{4} - \dfrac{y^2}{9} = 1$	(5)
	(b)	Find a Unit Vector Perpendicular to the plane containing vectors $\underline{a} = 2\underline{i} - 6\underline{j} - 3\underline{k}$ and $\underline{b} = 4\underline{i} + 3\underline{j} - \underline{k}$ Also find Sine of the angle between them.	(5)