Sargodha Board-2024

1224 **Warning:- Please write your Roll No. in the space provided and sign. Roll No----------**
(Inter Part – II) **(Session 2020-22 to 2022-24)** **Sig. of Student ----------**
Mathematics (Objective) **(Group 1st)** **Paper (II)**
Time Allowed:- 30 minutes **PAPER CODE 4197** **Maximum Marks:- 20**

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper,** on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed. **Q. 1**

1) If $f(x) = e^{\sqrt{x}-1}$, then $f'(0) =$

(A) e (B) $\frac{1}{e}$ (C) $\frac{1}{2}$ (D) ∞

2) $\int e^x(\sin x + \cos x)dx =$

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

3) $\int \frac{dx}{x(\ln 2x)^3} =$

(A) $\ln(\ln 2x)^3 + c$ (B) $\frac{(\ln 2x)^4}{4} + c$ (C) $\frac{1}{(\ln 2x)^3} + c$ (D) $-\frac{1}{2(\ln 2x)^2} + c$

4) If $f(x) = x^2$, then range of f is

(A) $[0,\infty[$ (B) $]-\infty, 0]$ (C) $]0,\infty[$ (D) R

5) If $f(x) = x\sec x$, then $f(\pi) =$

(A) π (B) 2π (C) $-\pi$ (D) -2π

6) If $y = e^{-ax}$, then $y\frac{dy}{dx} =$

(A) ae^{-2ax} (B) $-ae$ (C) a^2e^{-ax} (D) $-ae^{-ax}$

7) $f(x) = 4 - x^2$ decreases in the interval

(A) $]-\infty, 0[$ (B) $]0,\infty[$ (C) $(-2,2)$ (D) $(-\infty,+\infty)$

8) $\frac{1}{1+x^2}$ is the derivative of

(A) $\sin^{-1}x$ (B) $\cos^{-1}x$ (C) $\tan^{-1}x$ (D) $\cot^{-1}x$

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9) A vector perpendicular to both $2\hat{i}$ and $\hat{k}$ is

(A) $\hat{i}$ (B) $-2\hat{j}$ (C) $\hat{k}$ (D) $2i+k$

10) The angle between the vectors $2\hat{i}+3\hat{j}+\hat{k}$ and $2\hat{i}-\hat{j}-\hat{k}$ is

(A) 30^o (B) 45^o (C) 60^o (D) 90^o

11) $\int_0^{\pi/4} \sec^2 x\, dx =$

(A) 0 (B) 1 (C) $\sqrt{2}$ (D) $\frac{1}{\sqrt{2}}$

12) $\int_{-1}^{3} x^3 dx =$

(A) 20 (B) 40 (C) 60 (D) 80

13) The lines represented by $ax^2+2hxy+by^2=0$ are perpendicular if

(A) $a=b$ (B) $a=-b$ (C) $a\neq b$ (D) $a\geq b$

14) The equation of y-axis is

(A) $x=0$ (B) $y=0$ (C) $y=x$ (D) $x+y=0$

15) Slope of the line perpendicular to $3x-4y+5=0$ is

(A) $\frac{-3}{4}$ (B) $\frac{3}{4}$ (C) $\frac{-4}{3}$ (D) $\frac{4}{3}$

16) The graph of the Inequality y < b is a/an

(A) Upper half plane (B) Lower half plane (C) Right half plane (D) Left half plane

17) Angle Inscribed in a semi-circle is

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) 0

18) Equation of normal to the circle $x^2+y^2=25$ at point (4 , 3) is

(A) $4x+3y=5$ (B) $4x+3y=25$ (C) $4x+3y=0$ (D) $3x-4y=0$

19) If $c=\sqrt{65}$, $b=7$ and $a=4$, then eccentricity of hyperbola is

(A) $\frac{7}{4}$ (B) $\frac{65}{16}$ (C) $\frac{\sqrt{65}}{7}$ (D) $\frac{\sqrt{65}}{4}$

20) If $P(2,3)$ and $Q(6,-2)$ are two points in the plane, then vector $\overrightarrow{PQ}$ is

(A) $4i-5j$ (B) $-4i+5j$ (C) $4i+5j$ (D) $8i+j$

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Mathematics (Subjective) **(Group 1st)** **(Inter Part – II)** **Paper (II)**

Time Allowed: 2.30 hours **(Session 2020-22 to 2022-24)** **Maximum Marks: 80**

Section ---------- I

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Define exponential function. **(ii)** Prove the identity $\sec h^2 x = 1 - \tanh^2 x$

(iii) For real valued functions f and defined as

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

(iv) Evaluate the limit by algebraic techniques $\lim_{h \to 0} \frac{\sqrt{x+h} - \sqrt{x}}{h}$

(v) Find by definition, the derivative of $x^{\frac{5}{2}}$ with respect to 'x' **(vi)** Differentiate with respect to x of $\frac{(x^2+1)^2}{x^2-1}$

(vii) Find $\frac{dy}{dx}$ if $x^2 - 4xy - 5y = 0$ **(viii)** Differentiate with respect to 'θ' of $\tan^3\theta \sec^2\theta$

(ix) Find $\frac{dy}{dx}$ if $y = x^2 \ln \sqrt{x}$ **(x)** Find y_4 if $y = \sin 3x$

(xi) Prove that $e^{x+h} = e^x\{1 + h + \frac{h^2}{2!} + \frac{h^3}{3!} + ...\}$

(xii) Find interval in which 'f' is increasing or decreasing if $f(x) = x^2 + 3x + 2 \ , \ x \in (-4 \ , \ 1)$

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Using differentials, find $\frac{dx}{dy}$ when $xy - \ln x = c$ **(ii)** Evaluate $\int \frac{3 - \cos 2x}{1 + \cos 2x} dx$

(iii) Find the area between the $x-axis$ and the curve $y = \sin 2x$ from $x = 0$ to $x = \frac{\pi}{3}$

(iv) Solve the differential equation $\sec x + \tan y \frac{dy}{dx} = 0$ **(v)** Evaluate $\int_0^{\pi/6} x \cos x \, dx$

(vi) Evaluate $\int x^2 \ln x \, dx$ **(vii)** Find $\int \frac{x^2}{4 + x^2} dx$

(viii) Find the point three fifth of the way along the line-segment from A(-5 , 8) to B(5 , 3).

(ix) Write down an equation of straight line passing through (5 , 1) and parallel to line passing through points (0 , -1) , (7 , -15)

(x) The xy – coordinate axes are translated through point O' whose coordinates are given in xy – coordinate system. The coordinates of P are given in XY-coordinate system. Find coordinates of P in xy – coordinate system, here P(-5 , -3) , O'(-2 , -6).

(xi) Find area of the triangular region whose vertices are A(5 , 3) , B(-2 , 2) , C(4 , 2).

(xii) Find an equation of each of the lines represented by $10x^2 - 23xy - 5y^2 = 0$

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4. Answer briefly any Nine parts from the followings:- **9 × 2 = 18**

(i) What is an objective function?

(ii) Graph the solution set of $3x - 2y \geq 6$

(iii) Find centre and radius of circle $x^2 + y^2 + 12x - 10y = 0$

(iv) Write an equation of the circle with centre (-3 , 5) and radius 7.

(v) Find the focus and directrix of parabola $x^2 = 4(y-1)$

(vi) Find the focus and vertex of parabola $y = 6x^2 - 1$

(vii) Find the foci and vertices of ellipse $9x^2 + y^2 = 18$

(viii) Find the eccentricity of hyperbola $25x^2 - 16y^2 = 400$

(ix) Find the direction cosines of vector $\underline{v} = 6\underline{i} - 2\underline{j} + \underline{k}$

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

(xi) Calculate the projection of $\underline{a} = 3\underline{i} + \underline{j} - \underline{k}$ along $\underline{b} = -2\underline{i} - \underline{j} + \underline{k}$

(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) Find the value of α, so that $\alpha i + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplaner.

Section ---------- II

Note: Attempt any three questions. **(10 × 3 = 30)**

5 -(a) Evaluate the limit $\lim_{\theta \to 0} \dfrac{\tan\theta - \sin\theta}{\sin^3\theta}$

(b) If $y = \sqrt{\tan x + \sqrt{\tan x + \sqrt{\tan x + \ldots\ldots\infty}}}$, Prove that $(2y-1)\dfrac{dy}{dx} = \sec^2 x$

6 -(a) Show that $Y = X^X$ has minimum value at $X = \dfrac{1}{e}$

(b) Evaluate $\int \dfrac{x}{x^4 + 2x^2 + 5}\, dx$

7 -(a) Evaluate $\int_0^{\pi/4} \cos^4 t \, dt$

(b) Maximize $f(x, y) = 2x + 5y$ subject to the constraints $2y - x \leq 8$; $x - y \leq 4$; $x \geq 0$; $y \geq 0$

8 -(a) Find an equation of a circle of radius 'a' and lying in the second quadrant such that it is tangent to both the axes.

(b) Prove that the line segments joining the mid points of the sides of a quadrilateral taken in order form a parallelogram.

9 -(a) Find centre, foci and directrices of the ellipse $x^2 + 16x + 4y^2 - 16y + 76 = 0$

(b) Find a joint equation of lines through the origin and perpendicular to the lines $x^2 - 2xy\tan\alpha - y^2 = 0$

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(Inter Part – II) (Session 2020-22 to 2022-24) Sig. of Student ----------

Mathematics (Objective) **(Group 2nd)** **Paper (II)**

Time Allowed:- 30 minutes **PAPER CODE 4196** Maximum Marks:- 20

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper,** on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) $\int \ln a \cdot a^x \, dx =$

(A) $a^x + c$ (B) $\frac{a^x}{\ln a} + c$ (C) $\ln a^x + c$ (D) $2a^x + c$

2) $\int \frac{e^x}{e^x - 1} dx =$

(A) $\ln|1 - e^x| + c$ (B) $\ln|1 + e^{-x}| + c$ (C) $\ln|e^x - 1| + c$ (D) $\ln|1 - e^{-x}| + c$

3) $\lim_{x \to 0}(1 + 3x)^{\frac{2}{x}} =$

(A) e^2 (B) e^8 (C) e^6 (D) e^4

4) The perimeter P of a square as a function of its area A is

(A) $P = \sqrt{A}$ (B) $P = 4\sqrt{A}$ (C) $P = 4A$ (D) $P = \frac{1}{4}\sqrt{A}$

5) If $f(x) = \cot x$ then $f'\left(\frac{\pi}{6}\right) =$

(A) -4 (B) [illegible] (C) $\frac{1}{4}$ (D) $-\frac{1}{4}$

6) $\frac{d}{dx}\left[\ln(e^x + e^{-x})\right] =$

(A) $\frac{e^x - e^{-x}}{e^x - e^{-x}}$ (B) $\frac{e^x - e^{-x}}{e^x + e^{-x}}$ (C) $\frac{e^x - e^{-x}}{-e^x + e^{-x}}$ (D) $\frac{-e^x + e^{-x}}{e^x + e^{-x}}$

7) If $y = Sin\, h^{-1}(x^3)$ then $\frac{dy}{dx} =$

(A) $\frac{x^3}{\sqrt{1 + x^6}}$ (B) $\frac{-3x^2}{\sqrt{1 + x^6}}$ (C) $\frac{1}{\sqrt{1 + x^6}}$ (D) $\frac{3x^2}{\sqrt{1 + x^6}}$

8) The derivative of $y = \sec^{-1}\frac{x}{a}$ is

(A) $\frac{a}{x}(a^2 - x^2)^{\frac{-1}{2}}$ (B) $-x(a^2 - x^2)^{\frac{1}{2}}$ (C) $x(a^2 - x^2)^{\frac{-1}{2}}$ (D) $x(a^2 - x^2)^{3/2}$

The lines joining the mid points of any two sides of a triangle is always _____ to the third side.

(A) Equal (B) Parallel (C) Perpendicular (D) Base

10) If $\underline{u}$ and $\underline{v}$ be any vectors, then $\underline{u} \times \underline{v}$ is

(A) parallel to $\underline{u}$ and $\underline{v}$ (B) parallel to $\underline{u}$ (C) perpendicular to $\underline{u}$ and $\underline{v}$ (D) orthogonal to $\underline{u}$

11) $\int_a^b f(x)\,dx =$

(A) $\int_b^a f(x)\,dx$ (B) $-\int_b^a f(x)\,dx$ (C) $[f(x)]_a^b$ (D) $f(b)-f(a)$

12) $\int_0^4 x\,dx =$

(A) 0 (B) 6 (C) 8 (D) 16

13) The slope of the line $2x+3y-1=0$ is

(A) $-\frac{2}{3}$ (B) $\frac{2}{3}$ (C) $-\frac{3}{2}$ (D) $\frac{3}{2}$

14) The lines lying in the same plane are called

(A) Collinear (B) Coplanar (C) Concurrent (D) Coincident

15) If the points $(a\,,0)$, $(0\,,b)$ and $(x\,,y)$ are collinear then

(A) $\frac{x}{a}+\frac{y}{b}=0$ (B) $\frac{a}{x}+\frac{b}{y}=1$ (C) $\frac{x}{a}+\frac{y}{b}=-1$ (D) $\frac{x}{a}+\frac{y}{b}=1$

16) The graph of $x+2y \le 6$ is

(A) Open half plane (B) Closed half plane (C) Full plane (D) No any solution

17) The fixed line of the conic is known as

(A) x-axis (B) y-axis (C) directrix (D) latus rectum

18) The equation $a(x^2+y^2)+2gx+2fy+c=0$ represents a circle with centre

(A) $(-ag\,,-af)$ (B) $\left(-\frac{g}{a}\,,-\frac{f}{a}\right)$ (C) $\left(\frac{g}{a}\,,\frac{f}{a}\right)$ (D) $(ag\,,af)$

19) Equation of latus rectum of the parabola $x^2=-4ay$ is

(A) $x=a$ (B) $x=-a$ (C) $y=a$ (D) $y=-a$

20) $(\underline{a}-\underline{b})\cdot(\underline{a}+\underline{b}) =$

(A) $|\underline{a}|^2-|\underline{b}|^2$ (B) $|\underline{a}|^2+|\underline{b}|^2$ (C) $2(\underline{a}+\underline{b})$ (D) 0

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Mathematics (Subjective) **(Group 2nd)** (Inter Part – II) Paper (II)

Time Allowed: 2.30 hours (Session 2020-22 to 2022-24) Maximum Marks: 80

Section ---------- I

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Evaluate $\lim_{x\to -1}\left(\frac{x^3+x^2}{x^2-1}\right)$ (ii) Define inverse of a function f.

(iii) Show that $x = a\sec\theta$, $y = b\tan\theta$ represent the equation of hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$

(iv) Evaluate $\lim_{n\to\infty}\left(1-\frac{1}{n}\right)^n$ (v) Find $f'(x)$, if $y = x^2\ln\sqrt{x}$

(vi) Show that $\cos(x+h) = \cos x - h\sin x - \frac{h^2}{\lfloor 2}\cos x + \frac{h^3}{\lfloor 3}\sin x + ...$

(vii) Determine the interval in which f is decreasing , here $f(x) = \cos x$, $x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

(viii) If $x = y\sin y$, Find $\frac{dy}{dx}$ (ix) Differentiate $\sin^3 x$ *w.r.t* $\cos^2 x$

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

(xi) Write the Quotient rule for derivative of two functions. (xii) Find $\frac{dy}{dx}$, if $\begin{matrix} x = at^2 \\ y = 2at \end{matrix}$

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

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

(ii) Evaluate $\int\frac{3-\cos 2x}{1+\cos 2x}dx$ $\cos 2x \neq -1$ (iii) Evaluate $\int\frac{1}{x\ell nx}dx$

(iv) Evaluate $\int(\ell nx)^2\,dx$ (v) Evaluate $\int\frac{3x+1}{x^2-x+6}dx$ (vi) Evaluate $\int_0^{\frac{\pi}{3}}\cos^2 x\sin x\,dx$

(vii) Find the area between x-axis and curve $y = \sin 2x$ from $x = 0$ *to* $x = \frac{\pi}{3}$

(viii) Find 'h' such that A(-1 , h) , B(3 , 2) and C(7 , 3) are collinear

(ix) Find 'k' so that the lines joining A(7 , 3) , B(k , -6) and line joining C(-4 , 5) , D(-6 , 4) are perpendicular.

(x) Find point of intersection of lines $3x + y + 12 = 0$, $x + 2y - 1 = 0$

(xi) Find equation of lines represented by $20x^2 + 17xy - 24y^2 = 0$

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

4. Answer briefly any Nine parts from the followings:- **9 × 2 = 18**

(i) Graph the solution set of the linear inequality $3x+7y \geq 21$ in $xy-$plane.

(ii) Define feasible region and feasible solution.

(iii) Find an equation of the circle with ends of diameter at (-3 , 2) and (5 , -6)

(iv) Find centre and radius of the circle $4x^2+4y^2-8x+12y-25=0$

(v) Find equation of Normal to the circle $x^2+y^2=25$ at $(5\cos\theta\ ,\ 5\sin\theta)$

(vi) Write equation of parabola with directrix $x=-2$ and focus (2 , 2).

(vii) Find foci and vertices of the ellipse $x^2+4y^2=16$

(viii) Find equation of Hyperbola with foci $(\pm 5,0)$ and vertex $(3,0)$

(ix) Find sum of the vectors $\overrightarrow{AB}$ and $\overrightarrow{CD}$ given A(1 , -1) , B(2 , 0) , C(-1 , 3) and D(-2 , 2).

(x) let $\underline{u}=\underline{i}+2\underline{j}-\underline{k}$, $\underline{v}=3\underline{i}-2\underline{j}+2\underline{k}$, $\underline{w}=5\underline{i}-\underline{j}+3\underline{k}$. Find $|3\underline{v}+\underline{w}|$.

(xi) Find $\underline{v}$ for which $\underline{v}\cdot\underline{i}=0$, $\underline{v}\cdot\underline{j}=0$, $\underline{v}\cdot\underline{k}=0$.

(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) Find α so that $\alpha\underline{i}+\underline{j}$, $\underline{i}+\underline{j}+3\underline{k}$ *and* $2\underline{i}+\underline{j}-2\underline{k}$ are coplaner.

Section ---------- II

Note: Attempt any three questions. **(10 × 3 = 30)**

5 -(a) If $f(x)=\begin{cases} 3x & if \quad x\leq -2 \\ x^2-1 & if \quad -2<x<2 \\ 3 & if \quad x\geq 2 \end{cases}$

Discuss continuity at $x=2$

(b) Differentiate $\dfrac{(\sqrt{x}+1)(x^{3/2}-1)}{x^{3/2}-x^{1/2}}$ *w.r.t.* x

6 -(a) Show that $\int \dfrac{1}{\sqrt{a^2+x^2}}\,dx = \ell n(x+\sqrt{a^2+x^2})+c$ here $a>0$.

(b) If $x=\sin\theta$, $y=\sin m\theta$ show that $(1-x^2)y_2-xy_1+m^2y=0$

7 -(a) Evaluate the definite integral $\displaystyle\int_{\pi/6}^{\pi/2} \frac{\cos x}{\sin x\,(2+\sin x)}\,dx$

(b) Minimize $z=2x+y$ subject to the constraints $x+y\geq 3$; $7x+5y\leq 35$ $x\geq 0$; $y\geq 0$

8 -(a) Find the equation of the tangent drawn from $(-7,-2)$ to $(x+1)^2+(y-2)^2=26$

(b) Using vectors, prove that $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$

9 -(a) Find area of region bounded by the triangle whose sides are

$7x-y-10=0$, $10x+y-41=0$, $3x+2y+3=0$

(b) Find the centre , foci eccentricity, vertices of ellipse whose equation is

$x^2+16x+4y^2-16y+76=0$

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Q. 1

1) $\frac{d}{dx}\tan^{-1}x =$ _____

(A) $\frac{1}{1+x^2}$ (B) $\frac{-1}{1+x^2}$ (C) $\frac{1}{\sqrt{1+x^2}}$ (D) $\frac{-1}{\sqrt{1+x^2}}$

2) $\int_0^3 \frac{3}{x^2+9}dx$

(A) $\pi/6$ (B) $\frac{3\pi}{4}$ (C) $\pi/12$ (D) $\pi/4$

3) $\int \sec x \tan x dx$

(A) $\tan x + c$ (B) $\sec^2 x + c$ (C) $\sec x + c$ (D) $\tan^2 x + c$

4) $y = x^2 + 2x - 1$ is_____ function.

(A) Constant (B) Linear (C) Implicit (D) Explicit

5) $fof^{-1}(x)$ is_____ function.

(A) Constant (B) Identity (C) Even (D) Exponential

6) Value of dy , for $y = x^2$ and x changes from 2 to 2.1

(A) 0.4 (B) 0.2 (C) 0.1 (D) 0

7) $f(x) = x^{2/3}$, Then $f'(8) =$ _____

(A) $\frac{3}{2}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) 3

8) $\frac{d}{dx}e^{3x} =$ ____

(A) e^{3x} (B) $3e^{3x}$ (C) $\frac{e^{3x}}{3}$ (D) e^x

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9) Length of transverse axis of $\frac{x^2}{9} - \frac{y^2}{4} = 1$

(A) 3 (B) 6 (C) 2 (D) 4

10) If $\underline{u} = \underline{v}$,, Then $\underline{u} \cdot \underline{v} \times \underline{w}$ =_____

(A) 1 (B) 0 (C) -1 (D) $\propto$

11) Length of vector $2\underline{i} - \underline{j} - 2\underline{k}$ is

(A) 0 (B) 2 (C) 3 (D) 4

12) $\int e^x(\ell nx + \frac{1}{x})dx$

(A) $\frac{e^x}{x} + c$ (B) $e^x + c$ (C) $e^x \ell nx + c$ (D) $\ell nx + c$

13) $\int \tan \pi/4 \, dx$

(A) $\ell n \sin \pi/4 + c$ (B) $\sec^2 \pi/4 + c$ (C) $\frac{x}{4} + c$ (D) $x + c$

14) Mid point of A(1,2) and B (5,4) is

(A) (3,3) (B) (2,1) (C) (3,2) (D) (2,3)

15) Slope of line joining A(3,1) and B (4,7) is

(A) $\frac{6}{7}$ (B) 6 (C) $4/3$ (D) $7/3$

16) Equation of horizontal line through (3,4)

(A) $y = 3$ (B) $y = 4$ (C) $x = 3$ (D) $x = 4$

17) (1,0) is solution of_____

(A) $2x + 3y \geq 3$ (B) $2x - 3y \geq 3$ (C) $2x + y \geq 1$ (D) $x - 3y \geq 2$

18) Equation of latus rectum of $y^2 = 4x$ is

(A) $y = -2$ (B) $y = 2$ (C) $x = -2$ (D) $x = 2$

19) Radius of circle $x^2 + y^2 + 2y = 5$ is

(A) $\sqrt{6}$ (B) $\sqrt{5}$ (C) 4 (D) 2

20) Foci of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

(A) $(\pm c, 0)$ (B) $(0, \pm a)$ (C) $(\pm a, 0)$ (D) $(0, \pm b)$

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Mathematics (Subjective) (Group 1st) (Inter Part – II) Paper (II)

Time Allowed: 2.30 hours (Session 2019-21 to 2021-23) Maximum Marks: 80

Section ---------- I

2. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

(i) Prove the identity $\cosh^2 x + \sinh^2 x = \cosh 2x$

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

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

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

(v) Differentiate $x^2 + \frac{1}{x^2}$ w.r.t $x - \frac{1}{x}$

(vi) Prove that $\frac{d}{dx}(a^x) = a^x \ell na$ by ab-initio method. (vii) Differentiate $(lnx)^x$ w.r.t. x

(viii) If $y = \sin^{-1}\frac{x}{a}$, then show that $y_2 = x(a^2 - x^2)^{-3/2}$ (ix) Expand $(1+x)^n$ in the Maclaurin Series

(x) Determine the intervals in which f is increasing or decreasing if $f(x) = x^3 - 6x^2 + 9x$.

(xi) Define convex region and corner point.

(xii) Graph the solution region of the following system of linear inequalities and find the corner points.

$$2x - 3y \leq 6$$
$$2x + 3y \leq 12$$
$$x \geq 0$$

3. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

(i) If $y = \sqrt{x}$ find δy when x changes from 4 to 4.41. (ii) Evaluate $\int \frac{\sqrt{y}(y+1)}{y} dy$

(iii) Evaluate $\int \frac{2x}{\sqrt{4-x^2}} dx$ (iv) Evaluate $\int \tan^{-1} x \, dx$ (v) Evaluate $\int \frac{x e^x}{(1+x)^2} dx$

(vi) Evaluate $\int_2^5 x\sqrt{x^2-1} \, dx$ (vii) Find the area bounded by Cos function from $x = \frac{\pi}{2}$ to $x = \frac{-\pi}{2}$.

(viii) Find magnitude and direction cosines of $\underline{v} = 2\underline{i} + 3\underline{j} - 4\underline{k}$.

(ix) Calculate the projection of $\underline{a} = [3,1,-1]$ along $\underline{b} = [-2,-1,1]$.

(x) If $\underline{a} + \underline{b} + \underline{c} = 0$ then prove that $\underline{b} \times \underline{c} = \underline{c} \times \underline{a}$. (xi) Find the value of $2\underline{i} \times 2\underline{j} \cdot \underline{k}$.

(xii) Prove that $\underline{u} \cdot (\underline{v} \times \underline{w}) + \underline{v} \cdot (\underline{w} \times \underline{u}) + \underline{w} \cdot (\underline{u} \times \underline{v}) = 3\underline{u} \cdot (\underline{v} \times \underline{w})$

P.T.O **1220 -- 1223 -- 9000**

4. Answer briefly any Nine parts from the followings:- **9 × 2 = 18**

(i) Show that the points A(-1,2), B(7,5) and C(2,-6) are vertices of a right angle triangle.

(ii) Check whether the origin and point (5,-8) lies on same or opposite side of the line $3x+7y+15=0$

(iii) Find area of the region bounded by the triangle with vertices $(a,b+c),(a,b-c)$ *and* $(-a,c)$.

(iv) Find k so that the line joining A(7, 3), B(k,-6) and the line joining C(-4,5), D(-6,4) are parallel.

(v) Find equation of line passing through (-8, 5) and having slope undefined.

(vi) Find measure of angle between the lines represented by $6x^2-19xy+15y^2=0$

(vii) Find the distance of the point P(6,-1) to the line $6x-4y+9=0$.

(viii) Find equation of circle with ends of a diameter at (-3,2) and (5,-6).

(ix) Write equation of tangent to the circle $x^2+y^2=25$ at (4,3).

(x) Find centre and vertex of the Parabola $y^2=-8(x-3)$.

(xi) Find centre and foci of the ellipse $9x^2+y^2=18$

(xii) Find an equation of ellipse with given foci $\left(-3\sqrt{3},0\right)$ and vertices $(\pm 6,0)$.

(xiii) Find eccentricity and coordinates of the vertices of the hyperbola $\frac{y^2}{16}-\frac{x^2}{49}=1$

Section ---------- II

Note: Attempt any three questions. **(10 × 3 = 30)**

5 -(a) Evaluate $\lim_{\theta\to 0}\frac{\tan\theta-\sin\theta}{\sin^3\theta}$

(b) Differentiate $\frac{x^2+1}{x^2-1}$ w.r.t. $\frac{x-1}{x+1}$

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

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

7 -(a) Find the area between the $x-axis$ and the curve $y=\sqrt{2ax-x^2}$, when $a>0$

(b) Maximize $f(x,y)=x+3y$ subject to constraints $2x+5y\le 30,\ 5x+4y\le 20,\ x\ge 0,\ y\ge 0$

8 -(a) Show that $y=\frac{\ell n x}{x}$ has maximum value at $x=e$.

(b) Find an equation of the circle passing through A(3,-1), B(0,1) and having centre at $4x-3y-3=0$.

9 -(a) Find the focus, vertex and directrix of the parabola $x^2-4x-8y+4=0$.

(b) By using vectors, prove that $\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$.

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Mathematics (Objective) **(Group II)** ***Paper (II)***

Time Allowed:- 30 minutes **PAPER CODE 4196** Maximum Marks:- 20

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper,** on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) $\int \frac{1}{x^2}\,dx =$

(A) $\ell nx + c$ (B) $\ell nx^2 + c$ (C) $\frac{-2}{x^3} + c$ (D) $\frac{-1}{x} + c$

2) $\int_0^{\frac{3\pi}{2}} \cos x\,dx =$

(A) 0 (B) 1 (C) -1 (D) 2

3) $x = a\cos\theta$, $y = b\sin\theta$ are parametric equations of

(A) Circle (B) Parabola (C) Ellipse (D) Hyperbola

4) If $f(x) = \sqrt{x^2 - 1}$ then Domain of f is

(A) $(-\infty, \infty)$ (B) $[1, \infty)$ (C) $[0, \infty)$ (D) $(-\infty, -1] \cup [1, \infty)$

5) If $y = \frac{1}{x^2}$ then $\frac{dy}{dx}$ at $x = -1$ is

(A) 2 (B) 3 (C) $\frac{1}{3}$ (D) 4

6) $(1 + x^2)\frac{d}{dx}(\tan^{-1} x + \cot^{-1} x) =$

(A) 2 (B) $\frac{2}{1+x^2}$ (C) 0 (D) $\frac{-2}{1+x^2}$

7) If $f(x+h) = a^{x+h}$ then $f'(x) =$

(A) $a^{x+h}\ln(x+h)$ (B) $a^x \ln a$ (C) $a^x \ln x$ (D) $a^{x+h}\ln a$

8) $\frac{d}{dx}(\sinh^{-1} x) =$

(A) $\frac{1}{\sqrt{1+x^2}}$ (B) $\frac{-1}{\sqrt{1+x^2}}$ (C) $\frac{1}{\sqrt{1-x^2}}$ (D) $\frac{-1}{\sqrt{1-x^2}}$

9) If $\underline{a}$ and $\underline{b}$ are parallel vectors then $\underline{a} \times \underline{b} =$

(A) 1 (B) 0 (C) -1 (D) 2

10) If any two vectors of scalar triple product are equal, then its value is

(A) 0 (B) 1 (C) 2 (D) -1

11) $\int \frac{\sin 2x}{4\sin x}\, dx =$

(A) $\sin 2x + c$ (B) $2\sin 2x + c$ (C) $\frac{1}{2}\sin x + c$ (D) $2\sin x + c$

12) $\int \frac{-1}{x\sqrt{x^2-1}}\, dx =$

(A) $\tan^{-1} x + c$ (B) $\cos ec^{-1} x + c$ (C) $\sec^{-1} x + c$ (D) $\sin^{-1} x + c$

13) Slope of line perpendicular to $3x - 4y + k = 0$ is

(A) -1 (B) $\frac{4}{3}$ (C) $\frac{3}{4}$ (D) $\frac{-4}{3}$

14) Distance of line $5x + 12y + 39 = 0$ from (0, 0) is

(A) 3 (B) 5 (C) 13 (D) 39

15) Point $\left(\frac{3}{7}, \frac{-5}{7}\right)$ lies in quadrant

(A) I (B) II (C) III (D) IV

16) The point (1 , 2) satisfies the inequality

(A) $x + 2y > 3$ (B) $x - 2y > 3$ (C) $3x + 2y < 3$ (D) $x + 2y < 3$

17) What is the eccentricity of a point circle $x^2 + y^2 = 0$

(A) $\frac{1}{\sqrt{2}}$ (B) 1 (C) $\sqrt{2}$ (D) 0

18) Length of Latus rectum of a parabola $8x^2 = -32y$ is

(A) 16 (B) 4 (C) -4 (D) 8

19) The end points of the minor axis of the ellipse are called

(A) Foci (B) Vertices (C) Co-vertices (D) Directrices

20) A conic is said to be a hyperbola if

(A) e = 0 (B) e = 1 (C) e < 1 (D) e > 1

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Mathematics (Subjective) **(Group 2nd)** (Inter Part – II) Paper (II)

Time Allowed: 2.30 hours (Session 2019-21 to 2021-23) Maximum Marks: 80

Section ---------- I

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Evaluate $\lim_{x\to 3}\frac{x-3}{\sqrt{x}-\sqrt{3}}$ **(ii)** Given $f(x)=x^3-2x^2+4x-1$ then find $f(1)$ and $f(1+x)$

(iii) If $f(x)=2x^2+x-5$ then determine Left hand Limit and Right hand Limit at $x=1$

(iv) Differentiate $\frac{2x-3}{2x+1}$ w.r.t x. **(v)** If $x=1-t^2$ and $y=3t^2-2t^3$ then find $\frac{dy}{dx}$

(vi) Find $\frac{dy}{dx}$ if $4x^2+2hxy+by^2+2gx+2fy+c=0$

(vii) If $f(x)=\frac{e^{ax}-e^{-ax}}{e^{ax}+e^{-ax}}$ then find $f'(x)$ **(viii)** Find first four derivative of $\cos(ax+b)$

(ix) Expand a^x in the Maclaurin's series.

(x) Find the extreme values of the function $f(x)=3x^2-4x+5$

(xi) Indicate solution region by shading the inequality $3x+7y\geq 21$, $x-y\leq 2$

(xii) Define problem constraints.

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Find δy and dy of $y=x^2+2x$ when x changes from 2 to 1.8

(ii) Evaluate indefinite integral $\int\frac{(\sqrt{\theta}-1)^2}{\sqrt{\theta}}d\theta$ **(iii)** Find $\int\sin^2 x\,dx$

(iv) Evaluate $\int\frac{dx}{x(\ln 2x)^3}$ **(v)** Find $\int\frac{\sin\theta}{1+\cos^2\theta}d\theta$

(vi) Evaluate $\int\frac{\sec^2 x}{\sqrt{\tan x}}dx$ **(vii)** Find Integral by parts $\int x\ln x\,dx$

(viii) Find $\overrightarrow{OA}$ where $\overrightarrow{AB}=[4,-2]$ and $B(-2,5)$

(ix) Write the direction cosine of $\underline{v}=3\hat{i}-\hat{j}+2\hat{k}$

(x) Find $\sin\theta$ if $|\underline{a}\times\underline{b}|=\sqrt{185}$, $|\underline{a}|=\sqrt{26}$, $|\underline{b}|=3$

(xi) Calculate the projection of $\underline{a}=\hat{i}-\hat{k}$ along $\underline{b}=\hat{j}+\hat{k}$

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

P.T.O **1220A -- 1223 -- 9000**

4. Answer briefly any Nine parts from the followings:- **9 × 2 = 18**

(i) The points A(-5 , 2) and (5 , -4) are ends of a diameter of a circle. Find its centre and radius.

(ii) Show that A(-3 , 6) , B(3 , 2) , C(6 , 0) are collinear points.

(iii) Find the equation of a line of it is perpendicular to line with slope -6 and its y-intercept is $\frac{4}{3}$

(iv) Find the distance between parallel lines $2x-5y+13=0$, $2x-5y+6=0$

(v) Find k so that the line joining A(7 , 3) B(k , -6) and the line joining C(-4 , 5) and D(-6 , 4) are perpendicular.

(vi) Find the equation of a vertical line through (-5 , 3)

(vii) Find the lines represented by $2x^2+3xy-5y^2=0$

(viii) Find the centre and radius of a circle $5x^2+5y^2+14x+12y-10=0$

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

(x) Find vertex and directex of parabola $(x-1)^2=8(y+2)$

(xi) Find the equation of parabola with Focus (2 , 5) and directrex is y = 1

(xii) Find Foci and vertices of ellipse $25x^2+9y^2=225$

(xiii) Find the equation of hyperbola centre (0 , 0) , Focus (6 , 0) , vertex (4 , 0)

Section ---------- II

Note: Attempt any three questions. **(10 × 3 = 30)**

5 -(a) Evaluate $\lim_{\theta\to 0}\frac{\tan\theta-\sin\theta}{\sin^3\theta}$

(b) Prove that $y\frac{dy}{dx}+x=0$ if $x=\frac{1-t^2}{1+t^2}$; $y=\frac{2t}{1+t^2}$

6 -(a) Find a joint equation of the lines through the origion and perpendicular to the lines $x^2-2xy\tan\alpha-y^2=0$

(b) Evaluate $\int \cos ec^3x\ dx$

7 -(a) Evaluate $\int_0^{\pi/4}\frac{\sec\theta}{\sin\theta+\cos\theta}\,d\theta$

(b) Maximize $f(x)=2x+5y$ subject to the constraints $2y-x\le 8$, $x-y\le 4$, $x\ge 0$, $y\ge 0$

8 -(a) If $x=a(\theta-\sin\theta)$, $y=a(1+\cos x)$, then Show that $y^2\frac{d^2y}{dx^2}+a=0$

(b) Write an equation of the circle that passes through the points A(4 , 5) , B(-4 , -3) , C(8 , -3)

9 -(a) Find equation of ellipse with centre (0 , 0) , symmetric with both the axes and passing through points (2 , 3) and (6 , 1)

(b) Prove that in any triangle $c^2=a^2+b^2-2ab\cos C$

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(Inter Part – II) (Session 2018-20 to 2020-22) Sig. of Student ----------

Mathematics (Objective) **Paper (II)**

Time Allowed:- 30 minutes **PAPER CODE 4193** Maximum Marks:- 20

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper,** on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) $\int 2^x\,dx =$

(A) $\frac{\ell n2}{2^x}+c$ (B) $\frac{1}{2^x \ell n2}+c$ (C) $\frac{2^x}{\ell n2}+c$ (D) 2^x+c

2) The range of the function $f(x)=\sqrt{x^2-4}$ is,

(A) $R-(-2,2)$ (B) $[0,\infty)$ (C) Set of real numbers (D) $[-2,2]$

3) $\lim_{x\to 0}\frac{e^x-1}{x}=$

(A) 0 (B) 1 (C) e (D) ∞

4) $\frac{d}{dx}(\sqrt{\tan x})=$

(A) $\frac{1}{2\sqrt{\tan x}}\cdot\sec^2 x$ (B) $\frac{1}{\sqrt{\tan x}}\cdot\sec^2 x$ (C) $\frac{\sec x}{\sqrt{\tan x}}$ (D) $\frac{\sqrt{\sec x}}{\tan x}$

5) If $y=\sin\sqrt{x}$, *then* $\frac{dy}{dx}=$

(A) $Cos\sqrt{x}$ (B) $\frac{Cos\sqrt{x}}{\sqrt{x}}$ (C) $\frac{\sin\sqrt{x}}{2\sqrt{x}}$ (D) $\frac{\cos\sqrt{x}}{2\sqrt{x}}$

6) $\frac{d}{dx}\left(\frac{1}{1/\ell nx}\right)=$

(A) $\frac{1}{\ell nx}$ (B) x (C) ℓnx (D) $\frac{1}{x}$

7) $\frac{d}{dx}\left(\frac{1}{\operatorname{cosec} x}\right)=$

(A) $\frac{d}{dx}(\sin x)$ (B) $\frac{d}{dx}(\sec x)$ (C) $\frac{d}{dx}(\cot x)$ (D) $\frac{d}{dx}(\operatorname{cosec} x\ \cot x)$

8) $\int x^{-1}\,dx =$

(A) 0 (B) $\ell nx+c$ (C) $-x^{-2}+c$ (D) $-\ell nx+c$

9) The direction cosines of a vector $3\underline{i} - \underline{j} + 2\underline{k}$ are

(A) $\left[\frac{-3}{\sqrt{14}}, \frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}\right]$ (B) $\left[\frac{3}{\sqrt{14}}, -\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}\right]$ (C) $\left[\frac{3}{\sqrt{14}}, -\frac{1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}\right]$ (D) $\left[-\frac{3}{\sqrt{14}}, -\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}\right]$

10) The solution of the differential equation $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$ is,

(A) $y = \tan(e^{-x} + c)$ (B) $y = \tan^{-1}(e^{-x} + c)$. (C) $y = \tan(e^{x} + c)$ (D) $y = \tan^{-1}(e^{x} + c)$

11) $\int \frac{\cot x}{\ell n \sin x} dx =$

(A) $\ell n|\ell n|\sin x||+c$ (B) $\ell n|\sin x|+c$ (C) $\ell n|\cot x|+c$ (D) $\ell n|\tan x|+c$

12) If a line ℓ is perpendicular to x-axis, then its inclination is,

(A) 0° (B) 45° (C) 90° (D) 180°

13) The equation of the straight line whose slope is 2 and y-intercept 5 is ,

(A) $y = -5x + 2$ (B) $y = 5x + 2$ (C) $y = x + 2$ (D) $y = 2x + 5$

14) The distance of a point P(6 , -1) from the line $6x - 4y + 9 = 0$ is

(A) 49 (B) $\frac{49}{\sqrt{52}}$ (C) $\frac{\sqrt{49}}{52}$ (D) $\frac{49}{\sqrt{24}}$

15) The slope of line through the points (-2 , 4) , (5 , 11) is

(A) 0 (B) 1 (C) 2 (D) 3

16) Point (3 , 2) is not the solution of inequality

(A) $x + y > 2$ (B) $3x + 5y > 7$ (C) $3x + 5y < 7$ (D) $3x - 7y < 3$

17) The focus of the parabola $x^2 = 8y$ is

(A) (0 , -2) (B) (2 , 0) (C) (-2 , 0) (D) (0 , 2)

18) The eccentricity of the hyperbola is

(A) $e < 0$ (B) $0 < e < 1$ (C) $e = 1$ (D) $e > 1$

19) The Centre of the circle $(x-1)^2 + (y+3)^2 = 3$ is

(A) (-1 , -3) (B) (-1 , 3) (C) (1 , -3) (D) (1 , 3)

20) Which one of the following is not a unit vector,

(A) [1 , 0 , 0] (B) [0 , 1 , 0] (C) [0 , 0 , 1] (D) [1 , 1 , 0]

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Mathematics (Subjective) (Inter Part – II) Paper (II)

Time Allowed: 2.30 hours (Session 2018-20 to 2020-22) Maximum Marks: 80

Section ---------- I

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Prove that $\cos h^2 x + \sin h^2 x = \cos h 2x$

(ii) For the real valued function. $f(x) = 3x^3 + 7$, find $f^{-1}(x)$

(iii) Find $\lim_{\theta \to 0} \frac{1-\cos\theta}{\sin\theta}$ (iv) Find $\lim_{h \to 0}(1-2h)^{1/h}$

(v) Find the value of m, such that function is continuous at $x = 3$ $f(x) = \begin{cases} mx & , \ x < 3 \\ x^2 & , \ x \geq 3 \end{cases}$

(vi) If $y = \frac{x^2+1}{x^2-1}$, find $\frac{dy}{dx}$. (vii) Find $\frac{dy}{dx}$ if $x = at^2$ and $y = 2at$

(viii) Differentiate $\sin^3 x$ w.r.t $\cos^2 x$. (ix) If $y = \cot^{-1}\left(\frac{x}{a}\right)$, Find $\frac{dy}{dx}$.

(x) If $y = a^{\sqrt{x}}$, Find $\frac{dy}{dx}$. (xi) If $y = \ell n(x^2 + 2x)$, Find $\frac{dy}{dx}$. (xii) If $y = \cos(ax+b)$, Find y_2

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Evaluate $\int x\sqrt{x^2-1}\,dx$ (ii) Evaluate $\int \frac{dx}{\sqrt{x+1}-\sqrt{x}}$

(iii) Find $\int \tan^2 x\,dx$ (iv) Find $\int \frac{1}{1+\cos x}\,dx$

(v) Evaluate $\int \frac{3x+1}{x^2-x+6}\,dx$ (vi) Evaluate $\int \frac{2x}{x^2-a^2}\,dx$, $x > a$

(vii) Find δy and dy if $y = x^2 - 1$ when x changes from 3 to 3.02

(viii) Find $\int x \cos x\,dx$

(ix) Find the lines represented by the homogeneous equation $2x^2 + 3xy - 5y^2 = 0$

(x) Find h such that A(-1 , h) , B(3 , 2) and C(7 , 3) are collinear.

(xi) Find K so that the line joining A(7 , 3) , B(K , -6) and the line joining C(-4 , 5) , D(-6 , 4) are parallel.

(xii) Prove that the following lines are concurrent. $3x - 4y - 3 = 0$, $5x + 12y + 1 = 0$, $32x + 4y - 17 = 0$

P.T.O **1214** -- 1222 -- 29000

4. Answer briefly any Nine parts from the followings:- **9 × 2 = 18**

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

(ii) Define corner point.

(iii) Find an equation of the circle with ends of diameter at (-3 , 2) and (5 , -6)

(iv) Write down equation of the tangent to the circle $3x^2+3y^2+5x-13y+2=0$, at $\left(1,\frac{10}{3}\right)$

(v) Find the directrix of the parabola $x^2-4x-8y+4=0$

(vi) Find an equation of the ellipse with vertices $(0,\pm 5)$ and eccentricity $3/5$

(vii) Find vertices and directrices of the hyperbola $\frac{y^2}{16}-\frac{x^2}{9}=1$

(viii) Find the points of intersection of the conics $3x^2-4y^2=12$ and $3y^2-2x^2=7$

(ix) Find a unit vector in the direction of vector $\underline{v}=2\underline{i}-\underline{j}$

(x) Find a vector whose magnitude is 4 and is parallel to $2\underline{i}-3\underline{j}+6\underline{k}$

(xi) If $\underline{a}=2\underline{i}+\underline{j}-\underline{k}$ and $\underline{b}=\underline{i}-\underline{j}+\underline{k}$. Compute $\underline{a}\times\underline{b}$

(xii) Find a real number α , so that the vectors $\underline{u}=\alpha\underline{i}+2\alpha\underline{j}-\underline{k}$ and $\underline{v}=\underline{i}+\alpha\underline{j}+3\underline{k}$ are perpendicular

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

Section ---------- II

Note: Attempt any three questions. **(10 × 3 = 30)**

5 -(a) If θ is measured in radian, then show that $\lim_{\theta\to 0}\frac{\sin\theta}{\theta}=1$

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

6 -(a) Show that $\int\frac{dx}{\sqrt{x^2-a^2}}=\ln\left(x+\sqrt{x^2-a^2}\right)+c$

(b) The three points A(7 , -1) , B(-2 , 2) and C(1 , 4) are consecutive vertices of a parallelogram. Find the fourth vertex.

7 -(a) Evaluate definite integral. $\int_0^{\pi/2}\frac{\sin x}{(1+\cos x)(2+\cos x)}dx$

(b) Graph the feasible region of the system of linear inequalties and find the corner points.

$x+2y\le 14$; $3x+4y\le 36$; $2x+y\le 10$; $x\ge 0$; $y\ge 0$

8 -(a) Find the angle measured from the line ℓ_1 to the line ℓ_2 where ℓ_1: Joining (3 , -1) and (5 , 7)

ℓ_2 : Joining (2 , 4) and (-8 , 2)

(b) Show that the ordinate at any point P of the parabola is a mean proportional between the length of the latusrectum and the abscissa of P.

9 -(a) Discuss and Sketch the graph of the equation $4x^2-8x-y^2-2y-1=0$

(b) A force $\vec{F}=4\hat{i}-3\hat{k}$ passes through the point A(2 , -2 , 5). Find the moment of force $\vec{F}$ about the point B(1 , -3 , 1).

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(Inter Part – II) (Session 2015-17 to 2017-19) Sig. of Student ----------

Mathematics (Objective) **Paper (II)**

Time Allowed:- 30 minutes **PAPER CODE 4195** Maximum Marks:- 20

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper,** on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) $\int Cot\, x\, dx$ equals

(A) $\ell n\, Cos\, x + c$ (B) $\ell n\, Sin\, x + c$ (C) $-\ell n\, Cos\, x + c$ (D) $-\ell n\, Sin\, x + c$

2) $\int \frac{1}{x^2 + 2x + 5}\, dx$ equals

(A) $2\tan^{-1}\left(\frac{x+1}{2}\right) + c$ (B) $2\tan^{-1}\left(\frac{x-1}{2}\right) + c$ (C) $\frac{1}{2}\tan^{-1}\left(\frac{x-1}{2}\right) + c$ (D) $\frac{1}{2}\tan^{-1}\left(\frac{x+1}{2}\right) + c$

3) $x = at^2$ and $y = -2at$ are parametric equations of the curve

(A) $y^2 = -4ax$ (B) $y^2 = 4ax$ (C) $x^2 = -4ay$ (D) $x^2 = 4ay$

4) $\lim_{x \to 3} \frac{x-3}{\sqrt{x} - \sqrt{3}}$ equals

(A) $\frac{1}{2\sqrt{3}}$ (B) $\frac{1}{\sqrt{3}}$ (C) $\sqrt{3}$ (D) $2\sqrt{3}$

5) The derivative of Cot x w.r.t x equals

(A) $-Cosec^2 x$ (B) $Cosec^2 x$ (C) $-Sec^2 x$ (D) $Sec^2 x$

6) If $y = e^{f(x)}$, then $f'(x)$ will be equal to

(A) $y \cdot \frac{dy}{dx}$ (B) $y \cdot \frac{dx}{dy}$ (C) $\frac{1}{y}\,\frac{dy}{dx}$ (D) $\frac{1}{y}\,\frac{dx}{dy}$

7) $\frac{d}{dx}\left[\ell n(Sin\, hx)\right]$ equals

(A) $Cot\, hx$ (B) $\tan hx$ (C) $-Cot\, hx$ $\tanh x$

8) Slope of tangent to the curve $x^2 - y^2 - 12 = 0$ at point (4 , 2) will be equal to

(A) 4 (B) $\frac{1}{4}$ (C) 2 (D) $\frac{1}{2}$

9) It two vectors $\underline{i}-\underline{j}+\alpha\underline{k}$ and $\underline{i}-2\underline{j}-3\underline{k}$ are perpendicular, then 'α' will be equal to

(A) -2 (B) -3 (C) -1 (D) 1

10) Moment of force $\underline{F}$ about a point with position vector $\underline{r}$ will be equal to

(A) $\underline{F}\times\underline{r}$ (B) $\underline{r}\times\underline{F}$ (C) $\underline{d}\times\underline{F}$ (D) $\underline{F}\times\underline{d}$

11) $\int_0^{\pi/2} Cost\ dt$ will be equal to

(A) 1 (B) 2 (C) 0 (D) 3

12) Area bounded by curve $y=f(x)$ about $X-axis$ from $x=a$ to $x=b$ is denoted by

(A) $\int_a^b x\,dy$ (B) $\int_b^a x\,dy$ (C) $\int_b^a y\,dx$ (D) $\int_a^b y\,dx$

13) If (4 , -2) ; (-2 , 4) and (4 , 10) are vertices of triangle, then its centroid will be

(A) (-2 , 4) (B) (2 , 4) (C) (2 , -4) (D) (-2 , -4)

14) If the straight lines represented by $ax^2+2hxy+by^2=0$ are perpendicular, then

(A) $h^2-ab=0$ (B) $h^2+ab=0$ (C) $a+b=0$ (D) $a-b=0$

15) The angle from the line with slope 2 to the line with slope 1 will be

(A) $\tan^{-1}(3)$ (B) $\tan^{-1}\left(\frac{1}{3}\right)$ (C) $Cos^{-1}(3)$ (D) $Cos^{-1}\left(\frac{1}{3}\right)$

16) Equation of straight line passing through (0 , 0) and parallel to the line with slope 2 will be

(A) $x=\frac{2}{3}y$ (B) $x=y$ (C) $y=\frac{1}{2}x$ (D) $y=2x$

17) A function which is to be maximized or minimized is called

(A) Objective function (B) Optimal function (C) Constant function (D) Polynomial function

18) For ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$; a^2e^2 will be equal to

(A) b^2-a^2 (B) $a^2(1-b^2)$ (C) a^2-b^2 (D) a^2+b^2

19) The equation of tangent drawn from point (2 , 1) to the circle $x^2+y^2=5$ equals.

(A) $2y+x=0$ (B) $2y-x=0$ (C) $2x-y=0$ (D) $2x+y-5=0$

20) The co-ordinates of vertex of Parabola $x+8-y^2+2y=0$ will be

(A) (-9 , 1) (B) (9 , 1) (C) (9 , -1) (D) (-9 , -1)

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Mathematics (Subjective) (Inter Part -- II) Paper (II)

Time Allowed: 2.30 hours (Session 2015-17 to 2017-19) Maximum Marks: 80

Section ---------- I

2. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

(i) $f(x) = \sqrt{x+4}$ Find $f(x^2+4)$

(ii) Evaluate $\lim_{x\to 0}(1+3x)^{\frac{1}{x}}$ (iii) Evaluate $\lim_{x\to 0}\frac{x}{\tan x}$

(iv) Find $\frac{dy}{dx}$ if $y = \frac{x^2+1}{x^2-3}$ (v) Find $\frac{dy}{dx}$ if $xy + y^2 = 2$

(vi) Differentiate w.r.t x $Sin^{-1}\sqrt{1-x^2}$

(vii) Find $\frac{dy}{dx}$ if $y = \ell n(9-x^2)$ (viii) Find the extreme value of $f(x) = x^2 - x - 2$

(ix) Find $\frac{dy}{dx}$ if $y = 5\ e^{3x-4}$ (x) Find $\frac{dy}{dx}$ if $y = Sinh 3x$

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

(xii) Define point of inflection of a function.

3. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

(i) Find δy if $y = x^2 - 1$

(ii) Evaluate $\int \frac{1}{1+\cos x}dx, \left(-\frac{\pi}{2} < x < \frac{\pi}{2}\right)$

(iii) Find the approximate increase in the volume of a cube if the length of its each edge changes from 5 to 5.02

(iv) Evaluate $\int \frac{3x+2}{\sqrt{x}}\,dx$ (v) Evaluate $\int \frac{ax+b}{ax^2+2bx+c}\,dx$

(vi) Find $\int \frac{1}{x\,\ell n x}\,dx$ (vii) Find $\int x e^x\,dx$

(viii) Evaluate $\int x^5 \ell n x\,dx$

(ix) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} Cost\,dt$ (x) Evaluate $\int_0^2 (e^{x/2} - e^{-x/2})\,dx$

(xi) Define feasible solution.

(xii) Graph the solution set of $5x - 4y \le 20$

P.T.O **1230** -- 1219 -- 18000

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Mathematics (Objective) **Paper (II)**
Time Allowed:- 30 minutes **PAPER CODE 4195** Maximum Marks:- 20

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(A) $y^2 = -4ax$ (B) $y^2 = 4ax$ (C) $x^2 = -4ay$ (D) $x^2 = 4ay$

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5) The derivative of Cot x w.r.t x equals

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6) If $y = e^{f(x)}$, then $f'(x)$ will be equal to

(A) $y \cdot \frac{dy}{dx}$ (B) $y \cdot \frac{dx}{dy}$ (C) $\frac{1}{y}\,\frac{dy}{dx}$ (D) $\frac{1}{y}\,\frac{dx}{dy}$

7) $\frac{d}{dx}\left[\ell n(Sin\, hx)\right]$ equals

(A) $Cot\, hx$ (B) $\tan hx$ (C) $-Cot\, hx$ (D) $\tan h^2 x$

8) Slope of tangent to the curve $x^2 - y^2 - 12 = 0$ at point (4 , 2) will be equal to

(A) 4 (B) $\frac{1}{4}$ (C) 2 (D) $\frac{1}{2}$

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(Inter Part – II) (Session 2014-16 to 2016-18) Sig. of Student ----------

Mathematics (Objective) **Paper (II)**

Time Allowed:- 30 minutes **PAPER CODE 4193** Maximum Marks:- 20

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper,** on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed. **Q. 1**

1) $\int \frac{Cot\sqrt{x}}{\sqrt{x}} \cdot dx \cdot =$

(A) $2\log_e|Sin\sqrt{x}|+c$ (B) $2\log_a|Sin\sqrt{x}|+c$ (C) $\log_e|Sin\sqrt{x}|+c$ (D) $\log_a|Sin\sqrt{x}|+c$

2) The linear function f(x) = ax + b becomes constant if

(A) a = 10 , b = 0 (B) a = 1 , b = 0 (C) x = 1 , b = 0 (D) x = 10 , b = 0

3) If $f(x) = -2x + 8$, then $f^{-1}(-1) =$

(A) $\frac{9}{2}$ (B) $\frac{2}{9}$ (C) $\frac{7}{2}$ (D) $\frac{2}{7}$

4) If $y = e^{x\log_e a}$ then $y' =$

(A) $e^{x\ln a}$ (B) e^x (C) a^x (D) $a^x \log_e a$

5) If $y = e^{f(x)}$ then $f'(x) =$

(A) $\frac{dy}{dx}$ (B) $\frac{1}{y} \cdot \frac{dy}{dx}$ (C) $y.\frac{dy}{dx}$ (D) $\frac{1}{y} \cdot \frac{dx}{dy}$

6) $\frac{d}{dx}(Cos^2x - Sin^2x) =$

(A) 2 Cos 2x (B) -2 Cos 2x (C) -2 Sin 2x (D) 2 Sin 2x

7) If $f(x) = Tan\,x$ then $f'(\pi/6) =$

(A) $\frac{4}{3}$ (B) $\frac{3}{4}$ (C) $\frac{\sqrt{3}}{2}$ (D) $\frac{\sqrt{3}}{4}$

8) $\int a^{x^2}.x \cdot dx =$

(A) $\frac{a^x}{\log_e a}+c$ (B) $\frac{a^{x^2}}{2\log_e a}$ (C) $\frac{a^{x^2}}{2\log_a e}$ (D) $\frac{a^x}{2\log_e a}$

9) If $\phi'(x) = f(x)$ then $\phi(x)$ is called _____of $f(x)$

(A) Derivative (B) Integral (C) Differential (D) Definite Integral

10) If $\underline{a}$ and $\underline{b}$ are two non zero vectors then angle between $\underline{a}$ and $\underline{a} \times \underline{b}$. is always

(A) 0 (B) 30° (C) 90° (D) 60°

11) $\int \frac{1+x}{x} \cdot dx =$

(A) $\log_e |x| + c$ (B) $1 + \log_e |x| + c$ (C) $\log_e |1+x| + c$ (D) $x + \log_e |x| + c$

12) Distance of a point P(x,y) from x-axis is

(A) x (B) y (C) |x| (D) |y|

13) Centroid of the triangle with vertices A(2 , 1) , B(-1 , 3) , C(-1 , -4) is

(A) (3 , 1) (B) (0 , 0) (C) (2 , 2) (D) (-2 , -5)

14) The line ax + by + c = 0 is parallel to y-axis if

(A) c = 0 (B) a = 0 (C) a = b (D) b = 0

15) Equation of a line passing through (-2 , 5) having slope O is

(A) y = -5 (B) y = 5 (C) x = -2 (D) x = 2

16) x = 0 is not in the solution of inequality

(A) 2x + 3 > 0 (B) x + 4 > 0 (C) x + 5 > 0 (D) 2x + 3 < 0

17) Length of the diameter of the Circle $(x-5)^2 + (y-3)^2 = 8$ is

(A) 64 (B) 16 (C) $2\sqrt{2}$ (D) $4\sqrt{2}$

18) The line $y = mx + c$ will be tangent to the circle $x^2 + y^2 = a^2$ if

(A) $c = \frac{a}{m}$ (B) $c = \pm a\sqrt{1-m^2}$ (C) $c = \pm a\sqrt{1+m^2}$ (D) $c = \pm a\sqrt{m^2-1}$

19) Vertices of the Ellipse $\frac{x^2}{16} + \frac{y^2}{25} = 1$ are

(A) $(0, \pm 5)$ (B) $(\pm 5, 0)$ (C) $(\pm 4, 0)$ (D) $(0, \pm 4)$

20) If "α" is the direction angle of a vector, then

(A) $0 < \alpha < \pi$ (B) $0 \le \alpha \le \pi$ (C) $0 < \alpha \le \pi$ (D) $0 \le \alpha < \pi$