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 2nd)** SGD-2-24 **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) (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) $x(a^2 - x^2)^{3/2}$

SGD-2-24

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) SGD-2-24

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 $\cos(x+h) = \cos x - h\sin x - \frac{h^2}{\lfloor 2}\cos x + \frac{h^3}{\lfloor 3}\sin x + \ldots\ldots$

(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 $x = at^2$, $y = 2at$

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 $2x - 7y + 4 = 0$

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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

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