(Inter Part – II) (Session 2019-21 to 2021-23) Sig. of Student ----------

Mathematics (Objective) **(Group II)** SGD-12-2-23 **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) $\frac{-1}{\sqrt{1-x^2}}$

SGD-12-2-23

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

223 Warning:- Please, do not write anything on this question paper except your Roll No.

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**

SGD-12-2-23

(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 $\int \operatorname{cosec}^3 x\ dx$

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 $c^2=a^2+b^2-2ab\cos C$