SGD-12-1-23

1223 **Warning:- Please *write your Roll No.* in the space provided and sign. Roll No----------**

(Inter Part – II) **(Session 2019-21 to 2021-23)** **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) $\frac{d}{dx}\tan^{-1}x =$ _____

(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

SGD-12-1-23

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) $(0, \pm b)$

SGD-12-23

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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 × 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.

$$2x - 3y \le 6$$
$$2x + 3y \le 12$$
$$x \ge 0$$

3. Answer briefly any Eight parts from the followings:- **8 × 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 $\underline{u} \cdot (\underline{v} \times \underline{w}) + \underline{v} \cdot (\underline{w} \times \underline{u}) + \underline{w} \cdot (\underline{u} \times \underline{v}) = 3\underline{u} \cdot (\underline{v} \times \underline{w})$

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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 $\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$.