1222 Warning:- Please write your Roll No. in the space provided and sign. Roll No----------
(Inter Part – II) (Session 2018-20 to 2020-22) Sig. of Student ----------

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

Time Allowed:- 30 minutes **PAPER CODE 4193** SGD-22 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) $\frac{d}{dx}\left(\frac{1}{\cos ec\,x}\right) =$

(A) $\frac{d}{dx}(\sin x)$ (B) $\frac{d}{dx}(\sec x)$ (C) $\frac{d}{dx}(\cot x)$ (D) $\frac{d}{dx}(\cos ec\,x\ \cot x)$

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:- SGD-22 **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. $3x - 4y - 3 = 0$, $5x + 12y + 1 = 0$, $32x + 4y - 17 = 0$

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4. Answer briefly any Nine parts from the followings:- SGD-22 **9 × 2 = 18**

(i) Graph the solution set of the inequality $2x + y \leq 6$ 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.

$x + 2y \leq 14$; $3x + 4y \leq 36$; $2x + y \leq 10$; $x \geq 0$; $y \geq 0$

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).