

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)

SGD-1-24

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) \mathbb{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) $-ae^{-2ax}$ (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) $\cot^{-1} x$

P.T.O

1223 - 1224 - 9000 (4)

-- (2) --

SAD-1-24

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

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

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° (B) 45° (C) 60° (D) 90°

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) $8i + j$

1223 - 1224 - 9000 (4)

1224 Warning:- Please, do not write anything on this question paper except your Roll No.

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 $\sec^2 x = 1 + \tan^2 x$
- (iii) For real valued functions f and g defined as
 $f(x) = 3x^4 - 2x^2$, $g(x) = \frac{2}{\sqrt{x}}$, $x \neq 0$ Find $f \circ g(x)$ and $g \circ f(x)$
- (iv) Evaluate the limit by algebraic techniques $\lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h}$
- (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 $e^{x+h} = e^x \{1 + h + \frac{h^2}{2!} + \frac{h^3}{3!} + \dots\}$
- (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 $10x^2 - 23xy - 5y^2 = 0$

P.T.O

1224 -- 1224 -- 9000

-- (2) --

SGP-1-24
9 × 2 = 18

4. Answer briefly any Nine parts from the followings:-

- (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 $|\alpha \underline{i} + (\alpha + 1)\underline{j} + 2\underline{k}| = 3$
- (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 $\alpha \underline{i} + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplaner.

Section ----- II

Note: Attempt any three questions.

(10 × 3 = 30)

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

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

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

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

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 $x^2 - 2xy \tan \alpha - y^2 = 0$

1224 -- 1224 -- 9000