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Roll No. _____ to be filled in by the candidate.

R

Inter. (Part-II)-A-2022

(For all Sessions)

Paper Code	8	1	9	4

Mathematics (Objective Type)

Time: 30 Minutes

Rw R22

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 more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1.1. $\int \sec x\, dx$ = _____

(A) $\ell n|\sec x - \tan x| + c$ (B) $\ell n|\sec x + \cot x| + c$

(C) $\ell n|\sec x + \operatorname{cosec} x| + c$ (D) $\ell n|\sec x + \tan x| + c$

2. $\int_0^1 |x|\, dx$ = _____

(A) 1 (B) 2 (C) 0 (D) $\frac{1}{2}$

3. Solve $\frac{1}{y}dy = \frac{1}{x}dx$

(A) $y = xc$ (B) $y = -xc$ (C) $y = x^2 + c$ (D) $xy = c$

4. Distance between A(–1, 2) and C(2, –6) is _____

(A) $\sqrt{73}$ (B) $\sqrt{70}$ (C) 7 (D) 8

5. If $m_1 = m_2$ then lines are _____

(A) perpendicular (B) not parallel

(C) parallel (D) neither parallel nor perpendicular

6. Slope of $12x + 35y - 7 = 0$ is _____

(A) $\frac{12}{35}$ (B) $-\frac{12}{35}$ (C) $\frac{1}{35}$ (D) 12

7. Normal form of $x + y = 1$ is _____

(A) $x\cos\frac{\pi}{3} + y\sin\frac{\pi}{3} = \frac{1}{\sqrt{2}}$ (B) $x\cos\frac{\pi}{2} + y\sin\frac{\pi}{2} = 1$

(C) $x\cos\frac{\pi}{4} + y\sin\frac{\pi}{4} = \frac{1}{\sqrt{2}}$ (D) $x + y = 2$

8. If P(x, y) = 40x + 50y then P(1, –1) = _____

(A) 10 (B) 40 (C) 50 (D) –10

9. Centre of $5x^2 + 5y^2 + 24x + 36y + 10 = 0$ is _____

(A) (–12, –18) (B) $\left(\frac{-12}{5}, \frac{-18}{5}\right)$ (C) (12, 18) (D) (–12, 18)

10. Axis of $y^2 = -4ax$ is _____

(A) $y = 0$ (B) $y = a$ (C) $x = 0$ (D) $x = a$

11. Vertices of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is _____

(A) (± b, 0) (B) (a, b) (C) (± a, 0) (D) (– a, – b)

12. Scalar triple product of coplaner vectors is _____

(A) 1 (B) 0 (C) 2 (D) –1

13. $2\underline{i} \times 2\underline{j} \cdot 2\underline{k}$ = _____

(A) 4 (B) 2 (C) 8 (D) 16

14. Which one is even function

(A) sin x (B) cos x (C) tan x (D) x^{101}

15. If $f(x) = \sqrt{x^2 - 9}$; then range of f(x) is _____

(A) $(0, -\infty)$ (B) $(-\infty, \infty)$ (C) (–5, 5) (D) $(0, +\infty)$

16. $\frac{d}{dx} 2^x$ = _____

(A) $2^x \ell n 2$ (B) $2^x \ell n e$ (C) $2^x \ell n 4$ (D) $x\, 2^{x-1}$

17. Leibniz used _____ notation for derivative.

(A) $\dot{f}(x)$ (B) $f'(x)$ (C) D f(x) (D) $\frac{dy}{dx}$

18. $\frac{d}{dx}(\operatorname{cosec} 7x)$ = _____

(A) $\operatorname{cosec} 7x \cot 7x$ (B) $-\operatorname{cosec} x \cot x$ (C) $-7\operatorname{cosec} 7x \cot 7x$ (D) $\operatorname{cosec} 7x \tan 7x$

19. Which one is decreasing function

(A) 2 – 4x (B) 4x – 2 (C) 4x (D) 4x + 5

20. d (xy) = _____

(A) xdx + ydy (B) (x + y)dx (C) xdy + ydx (D) xdy – ydx

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Inter . (Part-II)-A-2022

MATHEMATICS (Essay Type) **(For All Sessions)**

Time: 2:30 Hours **SUBJECTIVE** **Marks: 80**

SECTION - I

2. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Search the domain and range from the real numbers of $g(x) = \sqrt{x^2-4}$

ii- The real valued functions f and g are defined below. Find (a) $f^2(x)$ (b) $g^2(x)$,

$$f(x) = \frac{1}{\sqrt{x-1}}; \quad x \neq 1, \quad g(x) = (x^2+1)^2$$

iii- Evaluate $\lim_{x \to \infty} \frac{5x^4 - 10x^2 + 1}{-3x^3 + 10x^2 + 50}$

iv- Evaluate $\lim_{\theta \to 0} \frac{\tan\theta - \sin\theta}{\sin^3\theta}$

v- Give any example and sketch graphically discontinuous function.

vi- Differentiate w.r. to 'x'; $\frac{(1+\sqrt{x})(x-x^{3/2})}{\sqrt{x}}$

vii- Find $\frac{dy}{dx}$ if $y = \sqrt{\frac{a^2+x^2}{a^2-x^2}}$

viii- Find the derivative w.r.t. variable involved $\cos\sqrt{x} + \sqrt{\sin x}$

ix- Find $f'(x)$ if $f(x) = \ell n(\sqrt{e^{2x} + e^{-2x}})$

x- Produce y_2 from $y = e^{ax} \sin bx$

xi- Determine the intervals in which f is increasing or decreasing;

$$f(x) = \cos x \qquad x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$$

xii- The perimeter of a triangle is 16 centimeters. If one side is of length 6 cm, what are lengths of the other sides for maximum area of the triangle?

3. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Use differential find $\frac{dy}{dx}$; $x^4 + y^2 = xy^2$

ii- Evaluate $\int \frac{e^{2x} + e^x}{e^x} dx$

iii- Evaluate $\int \sec x \, dx$

iv- Evaluate $\int \sin^{-1} x \, dx$

v- Evaluate $\int e^x \left(\frac{1}{x} + \ell n x\right) dx$

vi- Evaluate $\int \frac{5x+8}{(x+3)(2x-1)} dx$

vii- Evaluate $\int_1^2 \frac{x}{x^2+2} dx$

viii- Find the area between the x-axis and the curve $y = \sin 2x$ from $x = 0$ to $x = \frac{\pi}{3}$

ix- Show that the points A (–1, 2); B(7, 5) and C(2, –6) are vertices of a right triangle.

x- Find an equation of vertical line through (–5, 3)

xi- Convert $15y - 8x + 3 = 0$ in slope-intercept form.

xii- Find the lines represented by ; $x^2 - 2xy \sec\alpha + y^2 = 0$

4. Write short answers to any NINE questions: **(2 x 9 = 18)**

i- Indicate the solution set of inequality $3x - 2y \geq 6$

ii- What is objective function?

iii- Write an equation of circle with centre at $(\sqrt{2}, -3\sqrt{3})$ and radius $2\sqrt{2}$

iv- Check the position of the point (5, 6) with respect to the circle $x^2 + y^2 = 81$

v- Find an equation of parabola with focus (–3, 1) and directrix $x = 3$

vi- Determine the equation of ellipse having foci $(\pm 3, 0)$ and minor axis of length 10.

vii- Calculate the eccentricity of $\frac{y^2}{16} - \frac{x^2}{49} = 1$

viii- Find an equation of the normal line to $y^2 = 4ax$ at $(at^2, 2at)$

ix- If O is origin and $\overrightarrow{OP} = \overrightarrow{AB}$, find the point P when A and B are (–3, 7) and (1, 0) Respectively

x- Write the direction cosines of $\underline{v} = 2\underline{i} + 3\underline{j} + 4\underline{k}$

xi- Prove that in any triangle ABC, $a^2 = b^2 + c^2 - 2bc \cos A$

xii- If $\underline{a} + \underline{b} + \underline{c} = 0$, then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$

xiii- A force $\vec{F} = 3\underline{i} + 2\underline{j} - 4\underline{k}$ is applied at a point (1, –1, 2). Find the moment of $\vec{F}$ about the point (2, –1, 3)

SECTION – II

Note: Attempt any three questions from the following. **10 x 3 = 30**

5- **(a)** Show that $\lim_{x \to 0} \frac{a^x - 1}{x} = \log_e a$

(b) Show that $y = x^x$ has maximum value at $x = \frac{1}{e}$

6- **(a)** Integrate $\int \frac{4 + 7x}{(1+x)^2(2+3x)} dx$

(b) Find the point which is equidistant from the point A(5, 3), B(–2, 2) and C(4, 2). What is radius of circumcircle of triangle ABC.

7- **(a)** Find $\int_{\pi/6}^{\pi/4} \cos^2\theta \cot^2\theta \, d\theta$

(b) Minimize $Z = 2x + y$ subject to constraints $x + y \geq 3$, $7x + 5y \leq 35$, $x \geq 0$, $y \geq 0$

8- **(a)** Find the area of the triangular region. Whose vertices are A(5, 3), B(–2, 2), C(4, 2)

(b) Find the length of the chord cut off from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$

9- **(a)** Find equations of the common tangents to the two conics $\frac{x^2}{16} + \frac{y^2}{25} = 1$ and $\frac{x^2}{25} + \frac{y^2}{9} = 1$

(b) Use vectors, prove that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and half as long.