

Roll No. : _____

Objective
Paper Code

8196

Intermediate Part Second

MATHEMATICS (Objective) Group - II

Time: 30 Minutes

Marks: 20



Q.No.1

You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.

FSD-2-24

S.#	Questions	A	B	C	D
1	The suitable substitution for $\sqrt{x^2 - a^2}$ to be integrated:	$x = a \sin \theta$	$x = a \sec \theta$	$x = a \tan \theta$	$x = a \cos \theta$
2	$\int (ax + b)^n dx = :$	$\frac{(ax + b)^{n+1}}{a(n+1)} + c$	$\frac{(ax + b)^{n+1}}{b(n+1)} + c$	$\frac{(ax + b)^{n+1}}{a(n-1)} + c$	$\frac{a(ax + b)^{n+1}}{n+1} + c$
3	$\int \sqrt{1 - \cos 2x} dx = :$	$-\sqrt{2} \cos x + c$	$\sqrt{2} \sin x + c$	$\sqrt{2} \cos x + c$	$-\sqrt{2} \sin x + c$
4	$\int e^x \left(\frac{1}{x} + \ln x \right) dx = :$	$\frac{1}{x} e^x + c$	$e^x (\ln x) + c$	$\frac{e^x}{\ln x} + c$	$\frac{\ln x}{e^x} + c$
5	$\frac{d}{dx} (y^n) = :$	ny^{n-1}	ny^{n+1}	$ny^{n-1} \frac{dy}{dx}$	$ny^{n-1} \frac{dx}{dy}$
6	$\frac{d}{dx} (3^x) = :$	$3^x \ln 3$	3^x	3^{x-1}	3^{x+1}
7	If $f(x) = \frac{1}{x-1}$, then $f'(2) = :$	-1	1	0	2
8	$f(x) = -3x^2$ has maximum value at:	$x = -2$	$x = -1$	$x = 0$	$x = 1$
9	The function $f(x) = (x+2)^2$ is:	Even	Odd	Both A and B	Neither even nor odd
10	$\lim_{x \rightarrow 0} (1+3x)^{\frac{2}{x}} = :$	e^2	e^8	e^6	e^4
11	$(\underline{i} \times \underline{k}) \times \underline{j} = :$	0	$-\underline{j}$	0	\underline{i}
12	$ \cos \alpha \underline{i} + \sin \alpha \underline{j} + 0 \underline{k} = :$	0	1	2	-1
13	If $\underline{a} + \underline{b} + \underline{c} = 0$ then $\underline{a} \times \underline{b} \times \underline{c} = 0$	$\underline{a} \times \underline{b} \times \underline{c} = 0$	$\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$	$\underline{a} \cdot \underline{b} = \underline{b} \cdot \underline{c} = \underline{c} \cdot \underline{a}$	$\underline{a} = \underline{b} = \underline{c}$
14	Focus of the parabola $y^2 = -16x$ is:	(0, 4)	(0, -4)	(4, 0)	(-4, 0)
15	A circle is called a point circle if:	$r = 1$	$r = 0$	$r = 2$	$r = 3$
16	Eccentricity of ellipse is:	$e = 0$	$e > 1$	$0 < e < 1$	$e = 1$
17	The point (-1, 2) satisfies the inequality:	$x - y > 4$	$x - y \geq 4$	$x + y < 4$	$x + y > 5$
18	Equation of horizontal line through (7, -9) is:	$y = -9$	$y = 7$	$x = -9$	$x = 7$
19	If m_1 and m_2 are the slopes of two lines then lines are perpendicular if:	$m_1 m_2 = 0$	$m_1 m_2 + 1 = 0$	$m_1 m_2 + 2 = 0$	$m_1 = m_2$
20	Distance of point (1, -2) from y-axis is:	2	1	3	4

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SECTION - I

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2. Attempt any EIGHT parts:

(i) If $f(x) = \begin{cases} x+2, & x \leq -1 \\ c+2, & x > -1 \end{cases}$, then find c so that $\lim_{x \rightarrow -1} f(x)$ exists.(ii) Evaluate $\lim_{x \rightarrow \infty} \left(\frac{x}{1+x} \right)^x$ (iii) If $g(x) = \frac{3}{x-1}$, $x \neq 1$; then find $\text{gog}(x)$ (iv) Determine whether $f(x) = \frac{3x}{x^2+1}$ is even or odd.(v) Differentiate $\frac{2x-3}{2x+1}$ w.r.t x (vi) Find $\frac{dy}{dx}$ if $x = \theta + \frac{1}{\theta}$ and $y = \theta + 1$ (vii) Differentiate $\cos \sqrt{x} + \sqrt{\sin x}$ w.r.t x (viii) Differentiate $\sqrt{\tan x}$ w.r.t x (ix) Find $f'(x)$ if $f(x) = \ln(e^x + e^{-x})$ (x) Find y_2 if $x^3 - y^3 = a^3$ (xi) Prove that $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$ (xii) Determine the interval in which $f(x) = \sin x$ is decreasing; $x \in (-\pi, \pi)$

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3. Attempt any EIGHT parts:

(i) Find dy and δy for the function $y = \sqrt{x}$ when x changes from(ii) Evaluate $\int (3x^2 - 2x + 1) dx$ (iii) Evaluate the integral $\int \frac{1-x^2}{1+x^2} dx$ (iv) Evaluate $\int x^3 \ln x dx$ (v) Evaluate $\int \frac{2x}{x^2-a^2} dx$ (vi) Solve the definite integral $\int_0^1 (x^2 + 3x^3) dx$ (vii) Find the area between x -axis and the curve $y = \cos \frac{1}{2}x$ from $x = -\pi$ to $x = \pi$ (viii) Find 'h' such that points $A(-1, h)$, $B(3, 2)$ and $C(7, 3)$ are collinear.(ix) Find the slope and inclination of the line joining the points $(4, 6)$ and $(4, 8)$.(x) Find the equation of line through $(-4, 7)$ and parallel to the line $2x - 7y + 4 = 0$ (xi) Check whether the lines $4x - 3y - 8 = 0$; $3x - 4y - 6 = 0$ and $x - y - 2 = 0$ are concurrent or not.(xii) Find the angle between the pair of lines $x^2 + 2xy \sec \alpha + y^2 = 0$

(Continued P/2)

4. Attempt any NINE parts:

- (i) Indicate solution set of linear inequalities $3x + 7y \geq 21$, $x - y \leq 2$
- (ii) Define optimal solution.
- (iii) Find center and radius of the circle $x^2 + y^2 - 6x + 4y + 13 = 0$
- (iv) Find length of tangent drawn from point $(-5, 4)$ to the circle $5x^2 + 5y^2 - 10x + 15y - 131 = 0$
- (v) Find the vertex and directrix of parabola $x^2 = 5y$
- (vi) Find equation of ellipse with data vertices $(-1, 1)$, $(5, 1)$ Foci: $(4, 1)$, $(0, 1)$
- (vii) Find equation of hyperbola with data Foci $(0, \pm 9)$, directrices $y = \pm 4$
- (viii) Find equation of normal to $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at $(a \sec \theta, b \tan \theta)$
- (ix) Find unit vector in the direction of vector $\underline{v} = -\frac{\sqrt{3}}{2} \underline{i} - \frac{1}{2} \underline{j}$
- (x) Find direction cosines of vector $\underline{v} = 6 \underline{i} - 2 \underline{j} + \underline{k}$
- (xi) Show that the set of points $P(1, 3, 2)$, $Q(4, 1, 4)$ and $R(6, 5, 5)$ forms a right triangle.
- (xii) Compute cross product $\underline{b} \times \underline{a}$ if $\underline{a} = 3 \underline{i} - 2 \underline{j} + \underline{k}$, $\underline{b} = \underline{i} + \underline{j}$
- (xiii) Prove that vectors $\underline{i} - 2 \underline{j} + 3 \underline{k}$, $-2 \underline{i} + 3 \underline{j} - 4 \underline{k}$, $\underline{i} - 3 \underline{j} + 5 \underline{k}$ are coplanar.

SECTION - II

Attempt any THREE questions. Each question carries 10 marks.

5. (a) If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{k} & , x \neq 2 \\ k & , x = 2 \end{cases}$ find the value of 'k' for which $f(x)$ is continuous at $x = 2$. 05
- (b) Find $\frac{dy}{dx}$, if $y = x \sin^{-1} \left(\frac{x}{a} \right) + \sqrt{a^2 - x^2}$ 05
6. (a) Show that $y = x^x$ has minimum value at $x = \frac{1}{e}$ 05
- (b) Evaluate the indefinite integral $\int \sqrt{4 - 5x} dx$ 05
7. (a) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \frac{\cos x}{\sin x(2 + \sin x)} dx$ 05
- (b) Graph the feasible region for linear inequalities and find corner points:
 $2x + 3y \leq 18$; $2x + y \leq 10$; $x + 4y \leq 12$ 05
8. (a) Find an equation of circle passes through $A(5, 1)$ and tangent to line $2x - y - 10 = 0$ at $B(3, -4)$ 05
- (b) Prove that the angle in a semi-circle is a right angle. 05
9. (a) Find the focus, vertex and directrix of the parabola; $y^2 = -8(x - 3)$ 05
- (b) Find the lines represented by $9x^2 + 24xy + 16y^2 = 0$ and also find measure of the angle between them. 05