

MATHEMATICS — OBJECTIVE

Intermediate Part-II · 1st Annual 2024 — Group: II

Time: 30 Minutes	OBJECTIVE	Marks: 20
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NOTE: 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.

QUESTION NO. 1

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

MATHEMATICS — SUBJECTIVE

Intermediate Part-II · 1st Annual 2024 — Group: II

Time: 02:30 Hours	SUBJECTIVE	Marks: 80
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SECTION - I

QUESTION NO. 2 Attempt any EIGHT parts:

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i	If $f(x) = \{ x + 2, x \leq -1; c + 2, x > -1 \}$, 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 $g \circ g(x)$
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 $\cos x = 1 - \frac{x^2}{1 \cdot 2} + \frac{x^4}{1 \cdot 4} - \frac{x^6}{1 \cdot 6} + \dots$
xii	Determine the interval in which $f(x) = \sin x$ is decreasing; $x \in (-\pi, \pi)$

QUESTION NO. 3 Attempt any EIGHT parts:

16

i	Find dy and δy for the function $y = \sqrt{x}$ when x changes from 4 to 4.41
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 $\int_{-1}^3 (x^3 + 3x^2) dx$
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 $x^2 + 2xy \sec \alpha + y^2 = 0$

QUESTION NO. 4 Attempt any NINE parts:

18

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 $f(x) = \{ \frac{\sqrt{(2x+5)} - \sqrt{(x+7)}}{x-2}, x \neq 2; k, x = 2 \}$, find the value of 'k' for which f is continuous at $x = 2$.	05
(b)	Find $\frac{dy}{dx}$, if $y = x \sin^{-1}(\frac{x}{a}) + \sqrt{(a^2 - x^2)}$	05
6. (a)	Show that $y = x^x$ has minimum value at $x = \frac{1}{e}$	05

(b)	Evaluate the indefinite integral $\int \sqrt{4 - 5x^2} \, dx$	05
7. (a)	Evaluate $\int_{\pi/6}^{\pi/2} \frac{\cos x}{\sin x(2 + \sin x)} \, dx$	05
(b)	Graph the feasible region of 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

Notes on this transcription: This paper has no Urdu column; it is English throughout. • Objective Q11 option (A) is obscured by an ink blot and the source watermark; read as 1, but it may carry a leading minus sign — check against the original. • Q2(xi) uses the board's factorial bracket notation ($\{2$, $\{4$, $\{6$) as printed, i.e. $2!$, $4!$, $6!$. • Typeset by Tayarri from the original board paper; no answer key included.