FBD

Roll No. : _____

Objective
Paper Code
8197

Intermediate Part Second

MATHEMATICS (Objective)

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.**

S.#	Questions	A	B	C	D
1	$\int_{-1}^{2} x\,dx =$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{3}{2}$	$-\frac{3}{2}$
2	$\int \sec^2 x\,dx =$	$\cot x + c$	$\tan x + c$	$\sec x + c$	$\operatorname{cosec} x + c$
3	$\int \frac{\sec^2 x}{\tan x}dx - \int \frac{\operatorname{cosec}^2 x}{\cot x}dx =$	0	$2\ell n \tan x + c$	$2\ell n \cot x + c$	$\ell n \cot x + c$
4	$\int \frac{d}{dx}(x^n)\,dx =$	$\frac{x^{n+1}}{n+1} + c$	$n x^{n-1} + c$	$\frac{x^{n+1}}{n} + c$	$x^n + c$
5	$\frac{d}{dx}(5^x) =$	5^x	$5^x \cdot \ell n 5$	$\frac{5^x}{\ell n 5}$	$5(5^x)$
6	$\frac{d}{dx}(\sec^{-1} x + \operatorname{cosec}^{-1} x) =$	1	-1	0	2
7	$\frac{d}{dx}(\sin^{-1} x) =$	$\frac{-1}{\sqrt{1-x^2}}$	$\frac{1}{\sqrt{1+x^2}}$	$\frac{1}{\sqrt{1-x^2}}$	$\frac{-1}{\sqrt{1+x^2}}$
8	$\frac{d}{dx}\left(\frac{1}{x^2}\right)$ at $x = 1$ is =	-2	2	1	-1
9	$\lim_{n \to +\infty} \left(1 + \frac{3}{n}\right)^{2n} =$	e	e^2	e^3	e^6
10	The parametric equations $x = a \sec\theta$ and $y = b \tan\theta$ represent the equation of:	Hyperbola	Circle	Parabola	Ellipse
11	The non-zero vectors '$\underline{a}$' and '$\underline{b}$' are parallel if $\underline{a} \times \underline{b} =$	0	1	-1	(a , b)
12	If any two vectors of scalar triple product are equal then its value is:	1	2	-1	0
13	The length of latus-rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is:	$\frac{b^2}{a}$	$\frac{2b^2}{a}$	$\frac{2a^2}{b}$	$\frac{a^2}{b}$
14	Vertices of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ $a > b$ are:	$(\pm a, 0)$	$(0, \pm a)$	$(0, \pm b)$	$(\pm b, 0)$
15	Vertex of the parabola $y^2 = 4ax$ is:	(0 , 0)	(a , 0)	(0 , a)	(a , a)
16	(1 , 2) is one of the solution of inequality:	$2x + y > 5$	$2x - y \geq 5$	$2x + y < 3$	$2x + y < 5$
17	Two lines represented by $ax^2 + 2bxy + by^2 = 0$ are orthogonal if:	$a - b = 0$	$a + b = 0$	$a + b > 0$	$a + b < 0$
18	If m_1 and m_2 are slopes of two lines then lines are perpendicular if:	$m_1 m_2 = 0$	$m_1 m_2 + 1 = 0$	$m_1 m_2 - 1 = 0$	$m_1 - m_2 = 0$
19	The point of intersection of medians of a triangle is called:	Circumcenter	Orthocenter	Centroid	In-center
20	Distance of the points (2 , 3) from y-axis is:	2	3	5	$\sqrt{13}$

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4. **Attempt any NINE parts:** 18

(i) Show that the point $(\sqrt{176}, 7)$ is at a distance of 15 units from the origin.

(ii) Write an equation of the line which cuts x-axis at $(2, 0)$ and y-axis at $(0, -4)$

(iii) The points A $(-5, -2)$ and B $(5, -4)$ are ends of diameter of a circle, find the center and radius of the circle.

(iv) Transform the equation $5x - 12y + 39 = 0$ into two-intercept form.

(v) Find an equation of the line through $(-4, 7)$ and parallel to the line $2x - 7y + 4 = 0$

(vi) Find the focus and directrix of the parabola $y^2 = 8x$

(vii) Write an equation of the parabola with given elements Focus $(2, 5)$, directrix $y = 1$

(viii) Find an equation of the ellipse with given data foci $(\pm 3, 0)$ and minor axis of length 10

(ix) Find center, foci of the ellipse whose equation is $x^2 + 4y^2 = 16$

(x) Define norm of the vector.

(xi) Find the unit vector in the direction of the vector $\underline{v} = [-2, 4]$

(xii) Find the direction cosines of $\underline{v} = 6\underline{i} - 2\underline{j} + \underline{k}$

(xiii) Find the angle between the vectors $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{v} = -\underline{i} + \underline{j}$

SECTION – II Attempt any THREE questions. Each question carries 10 marks.

5. (a) Prove that $\lim_{x \to 0} \frac{a^x - 1}{x} = \log_e a$ 05

(b) If $x = \sin\theta$, $y = \sin m\theta$, show that $(1 - x^2)y_2 - xy_1 + m^2y = 0$ 05

6. (a) Show that $\int e^{ax} \sin bx \, dx = \frac{1}{\sqrt{a^2 + b^2}} e^{ax} \sin\left(bx - \tan^{-1}\frac{b}{a}\right) + c$ 05

(b) The points $(4, -2)$, $(-2, 4)$ and $(5, 5)$ are vertices of a triangle find "in-center" of the triangle. 05

7. (a) Evaluate the definite integral $\int_0^{\frac{\pi}{4}} \frac{\sec\theta}{\sin\theta + \cos\theta} d\theta$ 05

(b) Graph the feasible region of the system of linear inequalities and find the corner points
$2x - 3y \leq 6$, $2x + 3y \leq 12$, $x \geq 0$, $y \geq 0$ 05

8. (a) Show that $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touch externally. 05

(b) Prove that in any triangle ABC, $a^2 = b^2 + c^2 - 2bc \cos A$ 05

9. (a) Find the center, foci, eccentricity, vertices and equation of directrices of $\frac{x^2}{4} - \frac{y^2}{9} = 1$ 05

(b) Find the volume of the tetrahedron whose vertices are A(2, 1, 8), B(3, 2, 9), C(2, 1, 4) and D(3, 3, 0) 05