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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.

#	Questions	A	B	C	D
1	The lines through origin represented by $ax^2 + 2hxy + by^2 = 0$ are coincident if:	$h^2 = ab$	$h^2 + ab = 0$	$h^2 - ab > 0$	$h^2 - ab < 0$
2	Slope of the line parallel to x-axis is:	Undefined	1	0	-1
3	Distance of the point (−2 , 3) from y-axis is:	2	−2	3	−3
4	Intercept form of equation of a line is:	$\frac{x}{a} - \frac{y}{b} = 0$	$\frac{x}{a} + \frac{y}{b} = 0$	$\frac{x}{a} - \frac{y}{b} = 4$	$\frac{x}{a} + \frac{y}{b} = 1$
5	(1 , 0) is not the solution of the inequality:	$x - 3y < 0$	$7x + 2y < 8$	$3x + 5y < 7$	$4x - 3y < 9$
6	Two circles are said to be concentric circles if they have:	Same radius	Different center	Same center	Same diameter
7	The latus rectum of the parabola $y^2 = 4ax$ is:	$x = a$	$x = -a$	$y = a$	$y = -a$
8	The two separate parts of hyperbola are called:	Foci	Vertices	Directrices	Branches
9	$\underline{i} \times \underline{k} =$:	$-\underline{j}$	$\underline{j}$	$\underline{i}$	0
10	The position vector of any point in xy-plane is:	$x\underline{i} + y\underline{j} + z\underline{k}$	$y\underline{j} + z\underline{k}$	$x\underline{i} + y\underline{j}$	$x\underline{i} + z\underline{k}$
11	Cosh 2x = :	$\frac{e^{2x} - e^{-2x}}{2}$	$\frac{e^{x} - e^{-x}}{2}$	$\frac{e^{x} + e^{-x}}{2}$	$\frac{e^{2x} - e^{-2x}}{e^{2x} + e^{-2x}}$
12	$\lim\limits_{n \to +\infty} \left(1 + \frac{1}{n}\right)^{2n} =$:	e	e^2	e^4	e^6
13	The notation used for derivative of f(x) by Cauchy is:	$Df(x)$	$f'(x)$	$\dot{f}(x)$	$\frac{df}{dx}$
14	If $y = \ell nx$ then $y_1 =$:	$\frac{1}{x}$	$\frac{-1}{x}$	$\frac{-1}{x^2}$	$\frac{1}{x^2}$
15	$\frac{d}{dx}(e^{\sin x}) =$:	$\cos x$	$e^{\sin x} \cos x$	$e^{\sin x} \sin x$	$\sin x$
16	$\frac{d}{dx}(\tan^{-1} 3x) =$:	$\frac{1}{1 + 3x}$	$\frac{3}{1 + 3x}$	$\frac{1}{1 + 9x^2}$	$\frac{3}{1 + 9x^2}$
17	$\int x^{-1} dx =$:	$\ell nx + c$	$\frac{x^2}{2}$	$-x^{-2}$	0
18	$\int e^x \left[\sinh^{-1}x + \frac{1}{\sqrt{1 + x^2}}\right] dx =$:	$e^x \cosh^{-1} x$	$e^x \cos^{-1} x$	$e^x \sinh^{-1} x$	$e^x \sin^{-1} x$
19	$\int_0^1 \frac{1}{1 + x^2} dx =$:	$\frac{\pi}{3}$	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{\pi}{6}$
20	$\int \tan x \sec^2 x \, dx =$:	$\tan x + c$	$\sec^2 x + c$	$\sec x + c$	$\frac{\tan^2 x}{2} + c$

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Intermediate Part Second   Roll No. _____

MATHEMATICS (Subjective)   Group – II
Time: 02:30 Hours   Marks: 80

SECTION – 1

Attempt any EIGHT parts: 16

(i) Define implicit function.

(ii) Prove the identity $\text{sech}^2 x = 1 - \tanh^2 x$

(iii) Find $\underset{n \to 0}{\text{Lim}} \dfrac{e^{\frac{1}{x}} - 1}{e^{\frac{1}{x}} + 1}$, $x > 0$

(iv) If $y = x^4 + 2x^2 + 2$, prove that $\dfrac{dy}{dx} = 4x\sqrt{y-1}$

(v) Differentiate w.r.t. x if $y = \dfrac{2x-3}{2x+1}$

(vi) Differentiate $x^2 - \dfrac{1}{x^2}$ w.r.t. x^4

(vii) Prove that $\dfrac{d}{dx}(\sin^{-1} x) = \dfrac{1}{\sqrt{1-x^2}}$

(viii) Find $\dfrac{dy}{dx}$ if $y = x \cos y$

(ix) Differentiate $y = a^{\sqrt{x}}$

(x) Find $\dfrac{dy}{dx}$ if $y = \ell n (\tanh x)$

(xi) Define point of inflexion of a function.

(xii) Determine $f(x) = \sin x$ is increasing or decreasing in the interval $\left(0, \dfrac{\pi}{2}\right)$.

Attempt any EIGHT parts: 16

(i) Find δy and dy in $y = \sqrt{x}$, when x changes from 4 to 4.41

(ii) Evaluate $\int \sin^2 x \, dx$

(iii) Integrate by substitution $\int \dfrac{x}{\sqrt{4+x^2}} \, dx$

(iv) Find the integral $\int \dfrac{\sqrt{2}}{\sin x + \cos x} \, dx$

(v) Evaluate the integral by parts $\int \ell n x \, dx$

(vi) Find indefinite integral $\int \dfrac{1}{\sqrt{a^2 - x^2}} \, dx$ by substitution

(vii) Evaluate $\int \dfrac{2a}{x^2 - a^2} \, dx$, $x > a$ by partial fraction

(viii) What is the definition of definite integral?

(ix) Calculate the integral $\int_{-1}^{} |x - 3| \, dx$

(x) Define order of a differential equation.

(xi) What do you know about half planes?

(xii) Graph the linear inequality $2x + 3 \geq 0$

(Continued   P/2)

Attempt any NINE parts: 18

(i)   Find the point P on the join of A (1 , 4) and B (5 , 6) that is twice as far from A as B is from A and lies on the same side of A as B does.

(ii) Show that the points A (– 3 , 6), B (3 , 2) and C (6 , 0) are collinear.

(iii) Find an equation of the line through the points A (– 5 , – 3) and B (9 , – 1)

(iv) Find separate equations of lines represented by $6x^2 - 19xy + 15y^2 = 0$

(v)   Define eccentricity of the conic.

(vi) Find equation of parabola with focus (– 1 , 0), vertex (– 1 , 2)

(vii) Find equation of hyperbola with foci (± 5 , 0) vertex (3 , 0)

(viii) Define a circle.

(ix) Find sum of vectors $\vec{AB}$ and $\vec{CD}$ if A (1 , – 1), B (2 , 0), C (– 1 , 3), D (– 2 , 2).

(x)   Find a vector whose magnitude is 2 and is parallel to $-\underline{i} + \underline{j} + \underline{k}$

(xi) Find a scalar 'α' so that the vectors $2\underline{i} + \alpha\underline{j} + 5\underline{k}$ and $3\underline{i} + \underline{j} + \alpha\underline{k}$ are perpendicular.

(xii) Find area of triangle formed by P, Q, R if P (0 , 0 , 0), Q (2 , 3 , 2), R (– 1 , 1 , 4)

(xiii) Find 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 coplanar.

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

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

(b) If $x = a (\theta - \sin \theta)$; $y = a (1 + \cos \theta)$ then prove that $y^2 \dfrac{d^2 y}{dx^2} + a = 0$ 05

(a) Evaluate $\int \tan^3 x \sec x \, dx$ 05

(b) Find the equations of two parallel lines perpendicular to $2x - y + 3 = 0$ such that the product of the x- and y-intercepts of each is 3.   05

(a) Evaluate $\displaystyle\int_0^{\sqrt{3}} \frac{x^3 + 9x + 1}{x^2 + 9} \, dx$ 05

(b) Indicate the solution region of the following system of linear inequalities by shading:
$3x + 7y \le 21$, $2x - y \ge -3$, $x \ge 0$ 05

(a) Find an equation of the line through the intersection of $16x - 10y - 33 = 0$, $12x + 14y + 29 = 0$ and the intersection of $x - y - 4 = 0$, $x - 7y + 2 = 0$ 05

(b) Write the equations of tangent and normal to the circle $x^2 + y^2 = 25$ at the point (4 , 3)   05

(a) Show that the ordinate at any point P of the parabola is mean proportional between the length of Latus rectum and abscissa of P.   05

(b) Prove that $\sin (\alpha + \beta) = \sin\alpha \cos\beta + \cos\alpha \sin\beta$ 05