

MATHEMATICS

(INTERMEDIATE)

(***)

(PART - I)

21/01

Marks : 20

Time : 30 Minutes

(OBJECTIVE PART)

Note:- Write your Roll No. in space provided. Over writing, cutting, using of lead pencil will result in loss of marks. All questions are to be attempted.

1- Each question has four possible answers, Tick (✓) the correct answer. (20)

1	Solution set of the equation $x^2 - 7x + 10 = 0$ is;						
A	$\{-2, 5\}$	B	$\{-2, -5\}$	C	$\{2, -5\}$	D	$\{2, 5\}$
2	Partial fractions of $\frac{3x}{(x-1)(x+2)}$ are;						
A	$\frac{1}{x-1} + \frac{2}{x+2}$	B	$\frac{2}{x-1} + \frac{1}{x+2}$	C	$\frac{1}{x-1} - \frac{2}{x+2}$	D	$\frac{2}{x-1} - \frac{1}{x+2}$
3	A.M between $x+1$ and $(x-1)$ is;						
A	$x-1$	B	x	C	$\frac{x+1}{2}$	D	$\frac{x-1}{2}$
4	The common ratio of a geometric sequence cannot be;						
A	3	B	1	C	2	D	0
5	An infinite geometric series is convergent if;						
A	$ r \leq 1$	B	$ r < 1$	C	$ r < 2$	D	$ r > 1$
6	Trichotomy is the property of;						
A	Inequality	B	Equality	C	Division	D	Subtraction
7	Converse of $p \rightarrow q$ is;						
A	$\sim p \rightarrow q$	B	$p \rightarrow \sim q$	C	$q \rightarrow p$	D	$\sim p \rightarrow \sim q$
8	If a system of linear equations has a unique solution or infinitely many solutions then it can be known as;						
A	Consistent system	B	Inconsistent system	C	Non-linear system	D	Unique solution
9	The matrix $\begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ is a;						
A	Unit matrix	B	Scalar Matrix	C	Zero matrix	D	Rectangular matrix
10	If a polynomial function $f(x)$ is divided by $(x-a)$ then $f(x)$ is called;						
A	Divisor	B	Quotient	C	Remainder	D	Dividend

AJK-21

11	The period of $\tan\left(\frac{x}{3}\right)$ is;							
	A	π	B	2π	C	3π	D	4π
12	Number of the elements of a triangle are;							
	A	3	B	4	C	6	D	8
13	In-radius r of a triangle is;							
	A	$S\Delta$	B	$\frac{\Delta}{S}$	C	$\frac{S}{\Delta}$	D	$\frac{4ab}{\Delta}$
14	$\cos(\tan^{-1}(\sqrt{3}))$ is equal to;							
	A	$\frac{1}{2}$	B	$-\frac{1}{2}$	C	$\frac{\sqrt{3}}{2}$	D	$-\frac{\sqrt{3}}{2}$
15	If $\cos(2x) = 0$ then solution in 1 st quadrant is;							
	A	30°	B	45°	C	60°	D	15°
16	$\frac{8!}{6!} = \underline{\hspace{2cm}}$							
	A	8	B	6	C	50	D	56
17	The expansion $(1+x)^{-3}$ holds when;							
	A	$ x > 0$	B	$ x < 1$	C	$ x \leq 1$	D	$ x < 0$
18	$\cos(330^\circ) = \underline{\hspace{2cm}}$							
	A	$\frac{1}{2}$	B	$\frac{\sqrt{3}}{2}$	C	$\frac{2}{\sqrt{3}}$	D	$\frac{1}{\sqrt{2}}$
19	If l and r are in Cms, then the unit of θ is in;							
	A	Radians	B	Degree	C	Cm^2	D	Cm
20	$\sin(2\pi - \theta) = \underline{\hspace{2cm}}$							
	A	$\sin\theta$	B	$-\sin\theta$	C	$\cos\theta$	D	$-\cos\theta$

(The End)

Note:- Attempt any TWENTY FIVE (25) short questions in all selecting eight from Q. 2 and Q. 3 each and nine from Q. 4. (25 x 2 = 50)

A JK-21

SECTION - I

2- Write short answers of any eight questions. (2 x 8 = 16)

i	Show that $\forall z_1, z_2 \in C, \overline{z_1 z_2} = \overline{z_1} \overline{z_2}$	ii	Find out real and imaginary parts of complex number $(\sqrt{3} + i)^3$
iii	Factorize $a^2 + 4b^2$	iv	For the set $A = \{1,2,3,4\}$ Find the relation $\{(x, y) x + y > 5\}$. Also state domain and range of this relation.
v	Prepare the table of addition of the elements of set of residue classes modulo 4.	vi	Use Venn diagram to verify $(A - B)^c \cap B = B$
vii	Solve the matrix equation for X , $2X - 3A = B$ If $A = \begin{bmatrix} 1 & -1 & 2 \\ -2 & 4 & 5 \end{bmatrix}, B = \begin{bmatrix} 3 & -1 & 0 \\ 4 & 2 & 1 \end{bmatrix}$	viii	Without expansion show that $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} = 0$
ix	If $A = \begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$ Find A_{12} and A_{32}	x	Solve $x^{\frac{1}{2}} - x^{\frac{1}{4}} - 6 = 0$
xi	Find four fourth roots of 625.	xii	If α, β are the roots of $3x^2 - 2x + 4 = 0$ Find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$

3- Write short answers of any eight questions. (2 x 8 = 16)

i	Write $\frac{1}{(x-1)(2x-1)(3x-1)}$ in the form of partial fraction without finding constants.	ii	If $\frac{7x+25}{(x+3)(x+4)} = \frac{A}{x+3} + \frac{B}{x+4}$, then find the value of B.
iii	If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in G.P. Show that the common ratio is $\pm \sqrt{\frac{a}{c}}$	iv	Find the 5th term of G.P. 3,6,12,...
v	Find A.M. between x-3 and x+5	vi	If $a_{n-3} = 2n - 5$ Find the n th term of the sequence.
vii	What is the probability that a slip of numbers divisible by 4 is picked from the slips bearing numbers 1,2,3,...,10?	viii	Find the value of n if ${}^n C_{12} = {}^n C_6$
ix	Evaluate: $\frac{9!}{2!(9-2)!}$	x	Verify the statement $1 + 2 + 4 + \dots + 2^{n-1} = 2^n - 1$ for $n=2$ and $n=3$
xi	If x is so small that its square and higher powers can be neglected, then show that $\frac{1-x}{\sqrt{1+x}} \approx 1 - \frac{3}{2}x$	xii	Find the term involving x^{-2} in the expansion of $\left(x - \frac{2}{x^2}\right)^{13}$

4- Write short answers of any nine questions.

(2 x 9 = 18)

i	Convert into radians the $54^{\circ}45'$	ii	Find the value of $\cos\theta$ and $\tan\theta$, when $\sin\theta = \frac{12}{13}$ and terminal arm of the angle is in quadrant I
iii	Prove that $\frac{\sin\theta}{1+\cos\theta} + \cot\theta = \operatorname{cosec}\theta$	iv	Without use of table or calculator, Find the value of $\sin(-300^{\circ})$
v	Prove that $\tan(45^{\circ} + A)\tan(45^{\circ} - A) = 1$	vi	Express $\sin 5x + \sin 7x$ as a product.
vii	Find the period of $\tan 4x$	viii	Find the measure of greatest angle, if sides of the triangle are 16, 20, 33.
ix	Find the area of the triangle, whose sides are $a=18, b=24, c=30$	x	At the top of a cliff 80 m high, the angle of depression of a boat is 12° . How far is the boat from the cliff?
xi	Show that $\cos^{-1}\frac{12}{13} = \sin^{-1}\frac{5}{13}$ where domain of the function is $[0, \pi]$	xii	Find the value of the equation, which lies in $[0, 2\pi]$, $\sec x = -2$
xiii	Solve the trigonometric equation $\tan^2\theta = \frac{1}{3}$		

SECTION - II

Note:- Attempt any three questions.

(10 x 3 = 30)

5	a	Show that $\begin{vmatrix} x & 1 & 1 & 1 \\ 1 & x & 1 & 1 \\ 1 & 1 & x & 1 \\ 1 & 1 & 1 & x \end{vmatrix} = (x+3)(x-1)^3$	(05)
	b	Solve the equation $3^{2x-1} - 12 \cdot 3^x + 81 = 0$	(05)
6	a	Resolve into partial fraction. $\frac{1}{(x-1)^2(x^2+2)}$	(05)
	b	Find the 11 th term of the sequence. $1 + i, 2, \frac{4}{1+i}, \dots$	(05)
7	a	A die is thrown twice. What is the probability that the sum of the number of dots shown is 3 or 11.	(05)
	b	Find the term independent of x in the expansion $\left(\sqrt{x} + \frac{1}{2x^2}\right)^{10}$	(05)
8	a	Without using calculator / tables, show that $\cos 20^{\circ} \cos 40^{\circ} \cos 80^{\circ} = \frac{1}{8}$	(05)
	b	If $\sin\theta = \frac{12}{13}$ and terminal arm of the angle is in quadrant I, then find the remaining Trigonometric function.	(05)
9	a	Solve the following triangle using first law of tangents and then law of sines. If $b = 14.8, c = 16.1$ and $\alpha = 42^{\circ}45'$	(05)
	b	Prove that $2 \tan^{-1}\left(\frac{2}{3}\right) = \sin^{-1}\left(\frac{12}{13}\right)$	(05)

(The End)