MATHEMATICS **Intermediate Part-I , Class 11th (1stA 323)** **PAPER: I** **GROUP: II**

Time: 2:30 hours **SUBJECTIVE** **Marks: 80**

Note: Section-I is compulsory. Attempt any three (3) questions from Section-II.

SECTION-I

2. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- State the DeMoiver's theorem.

ii- Factorize $9a^2+16b^2$

iii- Write down two proper subsets of $\{0, 1\}$

iv- Construct truth table $(p \rightarrow \sim p) \vee (p \rightarrow q)$

v- Define unary and binary operations.

vi- Find matrix X if $X\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 12 & 3 \end{bmatrix}$

vii- Solve the following system of linear equations

$3x_1 - x_2 = 1 \quad , \quad x_1 + x_2 = 3$

viii- If $A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}$, verify that $(A^{-1})^t = (A^t)^{-1}$

ix- Solve the equation $x^{2/5} + 8 = 6x^{1/5}$

x- Find four fourth roots of 16

xi- Discuss the nature of the roots of a quadratic equation $x^2 + 2x + 3 = 0$

xii- When the polynomial $x^3 + 2x^2 + kx + 4$ is divided by $x - 2$, the remainder is 14. Find the value of k

3. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Define rational fraction.

ii- Write down the first four terms of the sequence, if $a_n = n \cdot a_{n-1} \quad , \quad a_1 = 1$

iii- Find the 13th term of the sequence $x, 1, 2-x, 3-2x, \ldots\ldots$

iv- Find the nth term of geometric sequence , if $\frac{a_5}{a_3} = \frac{4}{9}$ and $a_2 = \frac{4}{9}$

v- Sum to n terms of the series 3 + 33 + 333 + ...

vi- Find the 9th term of H.P. $\frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \ldots\ldots$

vii- Prove that ${}^nC_r = {}^nC_{n-r}$

viii- What is the probability that a slip of numbers divisible by 4 is picked from the slips bearing numbers $1, 2, 3, \ldots\ldots, 10$?

ix- If sample space $S=\{1, 2, 3, \ldots\ldots, 9\}$, event $A=\{2, 4, 6, 8\}$ and event $B=\{1, 3, 5\}$. Find P(A U B)

x- Prove by mathematical induction $r + r^2 + r^3 + \ldots\ldots + r^n = \frac{r(1-r^n)}{1-r} \quad , \quad r \neq 1$

xi- Find the 6th term in the expansion of $\left(x^2 - \frac{3}{2x}\right)^{10}$

xii- Evaluate $\sqrt[3]{30}$ correct to three places of decimal.

4. Write short answers to any NINE questions: **(2 x 9 = 18)**

i- Write down any two fundamental trigonometric identities.

ii- In which quadrant the terminal arm of the angle lie when $\sin\theta < 0$ and $\cos\theta > 0$

iii- Verify $\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ = \sin 30^\circ$

iv- Prove that $\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$

v- Prove that $\cot\alpha - \tan\alpha = 2\cot 2\alpha$

vi- Express $\sin(x + 30^\circ) + \sin(x - 30^\circ)$ as product .

vii- Write domain and range of $\text{Sin}\theta$

viii- A ladder leaning against a vertical wall makes an angle of 24° with the wall. Its foot is 5m from the wall. Find its length.

ix- Find the area of the triangle ABC, if $a = 18$, $b = 24$, $c = 30$

x- Prove that $r_1 r_2 r_3 = rs^2$

xi- Show that $\text{Cos}^{-1}(-x) = \pi - \text{Cos}^{-1}x$

xii- Find the value of $\text{Sin}\left(\text{Cos}^{-1}\frac{\sqrt{3}}{2}\right)$

xiii- Prove the identity $\text{Sin}^{-1}x = \frac{\pi}{2} - \text{Cos}^{-1}x$

SECTION-II

Note: Attempt any three (3) questions.

5- **(a)** Reduce the matrix $\begin{bmatrix} 2 & 3 & -1 & 9 \\ 1 & -1 & 2 & -3 \\ 3 & 1 & 3 & 2 \end{bmatrix}$ into echelon form 5

(b) Solve the equation $(x+4)(x+1) = \sqrt{x^2 + 2x - 15} + 3x + 31$ 5

6- **(a)** Resolve $\frac{(x-1)(x-3)(x-5)}{(x-2)(x-4)(x-6)}$ into partial fractions. 5

(b) Find the values of n and r, when ${}^nC_r = 35$ and ${}^nP_r = 210$ 5

7- **(a)** Find n so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be H.M. between 'a' and 'b'. 5

(b) Use mathematical induction to prove the formula for every positive integer n 5

$$1 + \frac{1}{2} + \frac{1}{4} + \ldots\ldots\ldots + \frac{1}{2^{n-1}} = 2\left[1 - \frac{1}{2^n}\right]$$

8- **(a)** If $\text{Cosec}\theta = \frac{m^2+1}{2m}$ and $m > 0$ $\left(0 < 0 < \frac{\pi}{2}\right)$, 5

Find values of remaining trigonometric ratios.

(b) Prove that $\text{Sin}10^\circ \text{Sin}30^\circ \text{Sin}50^\circ \text{Sin}70^\circ = \frac{1}{16}$ 5

9- **(a)** Prove that $\Delta = 4Rr \,.\, \text{Cos}\frac{\alpha}{2} \,.\, \text{Cos}\frac{\beta}{2} \,.\, \text{Cos}\frac{\gamma}{2}$ 5

(b) Prove that $\text{Sin}^{-1}\frac{1}{\sqrt{5}} + \text{Cot}^{-1}3 = \frac{\pi}{4}$ 5