

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- Define binary operation.
- ii- Show that the set $\{1, -1\}$ possess closure property with respect to multiplication.
- iii- Simplify the following $(-1)^{-21}$
- iv- Graph the number $-5 - 6i$ on complex plane.
- v- Write the union and intersection of two sets A and B in set builder notation.
- vi- Write down the difference between induction and deduction.
- vii- Find the value of x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$
- viii- If A and B are non-singular matrices then show that $(AB)^{-1} = B^{-1}A^{-1}$
- ix- Write down two properties of determinant.
- x- Solve the equation : $x^{1/2} - x^{1/4} - 6 = 0$
- xi- Show that $x^3 + y^3 + z^3 = (x + y + z)(x + \omega y + \omega^2 z)(x + \omega^2 y + \omega z)$
- xii- Show that $(x - 2)$ is a factor of $x^4 - 13x^2 + 36$

3. Write short answers to any EIGHT questions:

(2 x 8 = 16)

- i- What is the difference between proper rational fraction and improper rational fraction?
- ii- Find value of A and B if $\frac{x^2 + 1}{(x + 1)(x - 1)} = \frac{A}{x + 1} + \frac{B}{x - 1}$
- iii- Which term of the A.P 5, 2, -1, is -85?
- iv- Find the sum of infinite G.P : 2, $\sqrt{2}$, 1,
- v- Sum the series : 3 + 5 - 7 + 9 + 11 - 13 + 15 + 17 - 19 to 3n terms.
- vi- If $\frac{1}{K}$, $\frac{1}{2K + 1}$ and $\frac{1}{4K - 1}$ are in harmonic sequence, find K.
- vii- How many permutations of the letters of the word PANAMA can be made, if P is to the first letter in each arrangement?
- viii- Find the number of the diagonals of a 6-sided figure.
- ix- Two dice are thrown twice. What is probability that sum of dots shown in throw is 7?
- x- Prove that the statement is true : $n! > n^2$ for $n = 4, 5$
- xi- Use Binomial theorem, find the value of $(.98)^{1/2}$ up to three decimal places.
- xii- Find the term involving a^4 in the expansion of $\left(\frac{2}{x} - a\right)^9$

4. Write short answers to any NINE questions:

(2 x 9 = 18)

- i- Define Radian.
- ii- $\sin \theta = \frac{12}{13}$, terminal arm of the angle is in quadrant I. Find the values of $\sec \theta$, $\cos \theta$
- iii- Prove that $\cos\left(\frac{\pi}{2} - \beta\right) = \sin \beta$

(Turn Over)

- iv- Prove that $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ} = \tan 56^\circ$
- v- Express the product $\sin 12^\circ \sin 46^\circ$ as sum or difference.
- vi- Prove that period of tangent is π
- vii- Find the period of $3\sin x$
- viii- Draw the graph $y = -\sin x$, $x \in [-2\pi, 2\pi]$
- ix- Find the value of θ if $\cos \theta = 0.9316$
- x- Solve the right angle triangle in which $\gamma = 90^\circ$, $\alpha = 37^\circ 20'$, $a = 243$
- xi- Solve the triangle ABC, if $\beta = 60^\circ$, $\gamma = 15^\circ$, $b = \sqrt{6}$
- xii- Find the value of $\cos^{-1}(1/2)$
- xiii- Solve the equation : $\sin^2 x + \cos x = 1$

SECTION-II

- 5- (a) Show that $\begin{vmatrix} a+\lambda & b & c \\ a & b+\lambda & c \\ a & b & c+\lambda \end{vmatrix} = \lambda^2(a+b+c+\lambda)$ 5
- (b) If α and β are the roots of $x^2 - 3x + 5 = 0$, form the equation whose roots are: $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$ 5
- 6- (a) Resolve $\frac{x^2}{(x^2+4)(x+2)}$ into partial fractions. 5
- (b) Find a_n of a G.P if $a_4 = \frac{8}{27}$ and $a_7 = -\frac{64}{729}$ 5
- 7- (a) Prove that : ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^nC_r$ 5
- (b) Show that: $\frac{n^3 + 2n}{3}$ represents an integer $\forall n \in \mathbb{N}$ 5
- 8- (a) Prove that $\frac{\sin \theta + \sin 3\theta + \sin 5\theta + \sin 7\theta}{\cos \theta + \cos 3\theta + \cos 5\theta + \cos 7\theta} = \tan 4\theta$ 5
- (b) With usual notations, prove that $a^2 = b^2 + c^2 - 2bc \cos \alpha$ 5
- 9- (a) If $\tan \theta = -\frac{1}{3}$, and terminal arm of angle θ is in quadrant II. Find the values of remaining trigonometric functions. 5
- (b) Prove that $\tan^{-1} \frac{3}{4} + \tan^{-1} \frac{3}{5} + \tan^{-1} \frac{8}{19} = \frac{\pi}{4}$ 5