

(For All Sessions)

Mathematics (Subjective)**GROUP-II**

Time: 2:30 hours

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)
- Find the multiplicative inverse of $(-4, 7)$.
 - Prove that $\bar{Z} = Z$ if Z is a real number.
 - Write down the power set of $\{9, 11\}$.
 - Construct the truth table for $(P \wedge \sim P) \rightarrow q$.
 - Define a group.
 - If $A = \begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ find the value of a and b .

- Find x if $\begin{vmatrix} 1 & x-1 & 3 \\ -1 & x+1 & 2 \\ 2 & -2 & x \end{vmatrix} = 0$
- Show that AA^t is symmetric for any matrix of order 3×3 .
- Solve the equation: $(a+b)x^2 + (a+2b+c)x + b+c = 0$
- Find the condition that one root of $x^2 + px + q = 0$ is double the other.
- Show that the roots of $(mx+c)^2 = 4ax$ will be equal if $C = \frac{a}{m}, m \neq 0$
- Solve the equations simultaneously: $x+y=5; x^2+2y^2=17$

3. Write short answers of any eight parts from the following: (8x2=16)

- Resolve into $\frac{1}{x^2-1}$ partial fraction.
- Write the first three terms of $\left\{ \frac{a}{n} \right\} = \left\{ \frac{1}{2^n} \right\}$
- If n th term of the A.F. is $3n-1$, find the A.P.
- Evaluate: $4! \cdot 0! \cdot 1!$
- Which term of the sequence: $x^2 - y^2, (x+y), \frac{(x+y)}{(x-y)}, \dots$ is $\frac{x+y}{(x-y)^9}$?
- Define Harmonic Mean. Also derive formula.
- How many numbers greater than 1000,000 can be formed from the digits 0,2,2,2,3,4,4?
- Find the value of n when ${}^nC_{10} = \frac{12 \times 11}{2!}$
- Prove that: $n! > n^2$ for $n = 4, 5$.
- Expand $(1+x)^{-2}$ upto 3 terms.
- Find the sum of infinite G.P. $2, \sqrt{2}, 1, \dots$
- Using binomial theorems: $(1.03)^{1/3}$, calculate the value upto three decimal places.

4. Write short answers of any nine parts from the following: (9x2=18)

- Find θ when $r = 1.5 \text{ cm}, r = 2.5 \text{ cm}$
- Write domain and range of $\sin x$
- If $\tan \theta < 0$ and θ in which quadrant θ will lie.
- Prove that $\sin^2 \frac{\pi}{6} + \sin^2 \frac{\pi}{3} + \tan^2 \frac{\pi}{4} = 2$
- Prove that $R = \frac{abc}{4\Delta}$
- State law of Sines.
- Find the distance between $A(3, 8)$ and $B(5, 6)$.
- Prove that $\sin(45^\circ + \alpha) = \frac{1}{\sqrt{2}}(\sin \alpha + \cos \alpha)$
- Find the value of $\sin 2\alpha$ when $\cos \alpha = \frac{3}{5}$ and $0 < \alpha < \frac{\pi}{2}$
- For $\triangle ABC$ if $\alpha = 35^\circ 17'; \beta = 45^\circ 13'; b = 421$ find a and r .
- Solve $\cos x = \frac{\sqrt{3}}{2}$ where $x \in [0, 2\pi]$
- Find the value of $\cos(\sin^{-1} \frac{1}{\sqrt{2}})$
- Define trigonometric equation. Give one example.

SECTION-II

Note Attempt any three questions. Each question carries equal marks:

(10x3=30)

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

- (b) For what value of m will the roots of following equation be equal?
 $(1+m)x^2 - 2(1+3m)x + (1+8m) = 0$

6. (a) Resolve $\frac{x^2+1}{x^3+1}$ into partial fractions.

- (b) A card is drawn from a deck of 52 playing cards. What is the probability that it is a diamond card or an ace?

7. (a) Show that sum of n A.Ms between 'a' and 'b' is equal to n times their A.M.

- (b) If x is very near equal to 1. Then prove that $Px^p - qx^q \approx (p-q)x^{p+q}$

8. (a) A railway train is running on circular track of radius 500 meters at the rate of 30 km per hours. Through what angle it turn in 10 seconds.

- (b) Show that $\cos 20^\circ \cos 40^\circ \cos 80^\circ = \frac{1}{8}$

9. (a) Show that $r_1 = 4R \sin \frac{\alpha}{2} \cdot \cos \frac{\beta}{2} \cdot \cos \frac{\gamma}{2}$

- (b) Prove that $\tan^{-1} \frac{120}{1} = 2 \cos^{-1} \frac{12}{13}$