1109-XI124

Intermediate Part First

Roll No. ________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80

SECTION – I

2. **Attempt any EIGHT parts:** 16

(i) State Golden rule of fractions and rule for quotient of fractions.

(ii) Find multiplicative inverse of $(\sqrt{2}, -\sqrt{5})$

(iii) Prove that sum as well as product of two conjugate complex numbers is a real.

(iv) Simplify: $(a+bi)^{-2}$

(v) Write power set of $A = \{9, 11\}$

(vi) If a, b are elements of a group G, then show $(ab)^{-1} = b^{-1}a^{-1}$

(vii) If $A = \begin{bmatrix} i & 1+i \\ 1 & -i \end{bmatrix}$, show that $A - (\bar{A})^t$ is skew-Hermitian.

(viii) Evaluate: $\begin{vmatrix} 1 & 2 & -3 \\ -1 & 3 & 4 \\ -2 & 5 & 6 \end{vmatrix}$

(ix) If $A = \begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then find A^{-1}

(x) Find k if $x^3 + kx^2 - 7x + 6$ has remainder – 4, when divided by x + 2.

(xi) α, β are roots of $5x^2 - x + 2 = 0$, find $\frac{3}{\alpha} + \frac{3}{\beta}$

(xii) Discuss the nature of roots of $x^2 - 5x + 6 = 0$

3. **Attempt any EIGHT parts:** 16

(i) Define rational fraction.

(ii) Resolve into partial fractions $\frac{x^2 + x - 1}{(x+2)^3}$

(iii) Define sequence.

(iv) If the 5th term of an AP is 13 and its 17th term is 49, find its general term.

(v) Find vulgar fraction equivalent to $1.\dot{5}\dot{3}$ recurring decimal.

(vi) Find the 12th term of harmonic sequence $\frac{1}{3}, \frac{2}{9}, \frac{1}{6}, \ldots$

(vii) Evaluate: $\frac{10!}{7!}$

(viii) Define sample space.

(ix) Find the value of n if ${}^nC_{10} = \frac{12 \times 11}{2!}$

(x) Show that $5^n - 1$ is divisible by 4 if n = 5.

(xi) Expand $(1-2x)^{\frac{1}{3}}$ up to 4 terms.

(xii) Find the middle term of $\left(\frac{x}{2} + \frac{2}{x^2}\right)^{12}$

4. **Attempt any NINE parts:** 18

(i) If $\cos\theta = -\frac{\sqrt{3}}{2}$ and the terminal arm of the angle is in III quadrant, find the value of $\sin\theta$ and $\tan\theta$

(ii) Verify that $\cos 2\theta = 2\cos^2\theta - 1$ when $\theta = 30°$

(iii) Show that $\cos(\alpha+\beta)\cos(\alpha-\beta) = \cos^2\beta - \sin^2\alpha$

(iv) Prove that $\cot\alpha - \tan\alpha = 2\cot 2\alpha$

(v) Prove that $\frac{\sin 3x - \sin x}{\cos x - \cos 3x} = \cot 2x$

(vi) What is the domain and range of $y = \cos x$?

(Continued P . . . . . 2)

(vii) Find the period of $3\cos\frac{x}{5}$

(viii) Draw the graph of $y = \sin x$ for $0 \le x \le 360°$.

(ix) Find the measure of the greatest angle if sides of triangle are 16, 20, 33.

(x) Find the area of the triangle ABC, when $b = 37$, $c = 45$, $\alpha = 30°50'$

(xi) Prove that $r_1 r_2 r_3 = rs^2$

(xii) Prove that $2\tan^{-1} A = \tan^{-1}\frac{2A}{1-A^2}$

(xiii) Find the solution of equation $\sec x = -2$, $x \in [0, 2\pi]$

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

5. (a) If $A = \begin{bmatrix} 1 & -1 \\ a & b \end{bmatrix}$, $A^2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find the values of a and b. 05

(b) Solve the system of equations $x^2 - 5xy + 6y^2 = 0$; $x^2 + y^2 = 45$ 05

6. (a) Resolve into partial fractions: $\frac{x^4}{1-x^4}$ 05

(b) If $y = 1 + 2x + 4x^2 + 8x^3 + \ldots$ show that $x = \frac{y-1}{2y}$ 05

7. (a) Prove that ${}^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r}$ 05

(b) If $2y = \frac{1}{2^2} + \frac{1.3}{2!} \cdot \frac{1}{2^4} + \frac{1.3.5}{3!} \cdot \frac{1}{2^6} + \ldots$, then prove that $4y^2 + 4y - 1 = 0$ 05

8. (a) Find $\sin(\alpha + \beta)$ and $\cos(\alpha + \beta)$, given that $\tan\alpha = -\frac{15}{8}$ and $\sin\beta = -\frac{7}{25}$ and neither the terminal side of the angle of measure α nor that of β is in the IV quadrant. 05

(b) Prove that $r_1 r_2 + r_2 r_3 + r_3 r_1 = s^2$ 05

9. (a) Prove the identity, state the domain of θ, $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$ 05

(b) Prove that $\tan^{-1}\frac{120}{119} = 2\cos^{-1}\frac{12}{13}$ 05