1124 **Warning:- Please write your Roll No. in the space provided and sign. Roll No----------**

(Inter Part – I) **(Session 2020-22 to 2023-25)** **Sig. of Student ----------**

Mathematics (Objective) **(Group-II)** SGD-2-24 **Paper (I)**

Time Allowed:- 30 minutes **PAPER CODE 2198** **Maximum Marks:- 20**

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper, on** the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) The transpose of a rectangular matrix is a

(A) Square matrix (B) Diagonal matrix (C) Rectangular matrix (D) Scalar matrix

2) $1-\omega+\omega^2=$

(A) -1 (B) 0 (C) $-\omega$ (D) -2ω

3) The quadratic equation with roots $3-\sqrt{3}$, $3+\sqrt{3}$ is

(A) $x^2+4x+1=0$ (B) $x^2-4x+1=0$ (C) $x^2-6x+6=0$ (D) $x^2-6x-6=0$

4) The reflexive property of equality of real numbers is that $\forall\ a \in \mathbb{R}$

(A) $a=a$ (B) $a\neq a$ (C) $a<a$ (D) $a>a$

5) $|Z|^2=$

(A) Z^2 (B) $Z\bar{Z}$ (C) $\bar{Z}^2$ (D) Z

6) $\{x \mid x \in N,\ x \leq 10\}$ is the

(A) Discriptive method (B) Tabular method (C) Set builder method (D) Non-discriptive method

7) $p: 4<7$, $q: 6>11$, the disjunction $p \vee q$ is

(A) False (B) True (C) Not valid (D) unknown

8) The identity element of a set X with respect to intersection in P(X) is

(A) 0 (B) ϕ (C) Does not exist (D) X

9) If $A=\begin{bmatrix} x & 1 \\ 1 & 1 \end{bmatrix}$ and $\frac{1}{|A|}=7$, then $x=$

(A) $\frac{8}{7}$ (B) $\frac{7}{8}$ (C) $\frac{9}{7}$ (D) 7

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10) $r_1 r_2 r_3 =$

(A) Rr^2 (B) rR^2 (C) RS^2 (D) YS^2

11) $2\cos^{-1} A =$

(A) $\sin^{-1}\{2A^2-1\}$ (B) $\sin^{-1}\{A^2-2\}$ (C) $\cos^{-1}\{2A^2-1\}$ (D) $\cos^{-1}\{A^2-2\}$

12) $\cos x = -\frac{1}{\sqrt{2}}$ and $x \in [0,\pi]$ then $x =$

(A) $\frac{3\pi}{4}$ (B) $\frac{5\pi}{4}$ (C) $\frac{\pi}{4}$ (D) $\frac{-\pi}{4}$

13) $(x-4)^2 = x^2 - 8x + 16$ is

(A) A linear equation (B) Cubic equation (C) An equation (D) An identity

14) A number A is said to be the arithmatic mean between two numbers a and b if a , A , b is

(A) G.P (B) A.P (C) H.P (D) Not a sequence

15) If a = 3 , r = 2 then nth term of the G.P is

(A) 3.2^{n-1} (B) 2.3^{n-1} (C) 3.2^{n} (D) 3.2^{n+1}

16) $n(n-1)(n-2)(n-3)...(n-r+1) =$

(A) $n!r!$ (B) $\frac{n!}{r!}$ (C) $\frac{n!}{(n-r)!}$ (D) $n!$

17) The sum of the odd coefficients in the expansion $(1+x)^3$ is

(A) 4 (B) 8 (C) 12 (D) 16

18) $120^\circ =$ _____ radians

(A) $\frac{3\pi}{2}$ (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{2}$ (D) 180π

19) $2\sin^2\left(\frac{\alpha}{2}\right) =$

(A) $1+\sin\alpha$ (B) $1-\sin\alpha$ (C) $1+\cos\alpha$ (D) $1-\cos\alpha$

20) The range of $\sin x$ is

(A) [-1 , 1] (B)]-1 , 1[(C) $\mathbb{R}$ (D)]-1 , 1]

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Mathematics (Subjective) (Session 2020-22 to 2023-25) Paper (I)

Time Allowed: 2.30 hours (Inter Part - I) (Group-II) Maximum Marks: 80

Section ---------- I

2. Answer briefly any Eight parts from the followings:- 8 × 2 = 16

(i) Prove the rule of addition $\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$

(ii) Separate real and imaginary parts $\frac{2-7i}{4+5i}$ (iii) Find the multiplicative inverse of $-3-5i$

(iv) For any complex number $z \in C$, prove that $z \cdot \bar{z} = |z|^2$

(v) If $S = \{0, 1, 2\}$, then show that S is an abelian group under addition. Wrong

(vi) Construct the truth table of the statement $(p \wedge \sim p) \longrightarrow q$

(vii) If $B=\begin{bmatrix} 5 & -2 & 5 \\ 3 & -1 & 4 \\ -2 & 1 & -2 \end{bmatrix}$, then find B_{21} and B_{23}.

(viii) If A is symmetric or skew-symmetric, show that A^2 is symmetric

(ix) Find the matrix X if $X\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix}=\begin{bmatrix} -1 & 5 \\ 12 & 3 \end{bmatrix}$

(x) Show that the product of all the three cube roots of unity is unity.

(xi) If α, β are the roots of $x^2 - px - p - c = 0$, prove that $(1+\alpha)(1+\beta) = 1 - c$

(xii) Solve the equation $x^4 - 6x^2 + 8 = 0$

3. Answer briefly any Eight parts from the followings:- 8 × 2 = 16

(i) Define a Rational Fraction with example.

(ii) Resolve into partial Fraction without determining the constants $\frac{3x^2-4x-5}{(x-2)(x^2+7x+10)}$

(iii) If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in A.P, show that $b=\frac{2ac}{a+c}$ (iv) If $S_n = n(2n+1)$, then find the series

(v) A.M between two numbers is 5 and their positive G.M is 4. Find the numbers.

(vi) If 5 is Harmonic Mean between 2 and b. Find b (vii) Find the value of n, when ${}^{n}P_4 : {}^{n-1}P_3 = 9 : 1$

(viii) A die is rolled, what is the probability that the top shows dot 3 or 4.

(ix) Find the number of the diagonals of a 6 – sided figure. (x) State the principle of Mathematical induction.

(xi) Prove the formula 2+4+6+...2n = n(n+1) (xii) Find the general term of $\left(\frac{a}{2}-\frac{2}{a}\right)^6$

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4. **Answer briefly any Nine parts from the followings:-** **9 × 2 = 18**

(i) State fundamental identities. **(ii)** Verify that $\sin^2\frac{\pi}{6}:\sin^2\frac{\pi}{4}:\sin^2\frac{\pi}{3}:\sin^2\frac{\pi}{2}=1:2:3:4$

(iii) Prove that $\cos 330^\circ \sin 600^\circ + \cos 120^\circ \sin 150^\circ = -1$

(iv) Show that $\cot(\alpha+\beta)=\dfrac{\cot\alpha\cot\beta-1}{\cot\alpha+\cot\beta}$ **(v)** Prove that $\sin(\alpha+\beta)-\sin(\alpha-\beta)=2\cos\alpha\sin\beta$

(vi) Write down the Domain and Range of secant function. **(vii)** Find the period of $\tan 4x$

(viii) Draw the graph of $y=\sin x$ from 0 to π

(ix) Define the angles of elevation and depression. **(x)** What do you mean by oblique triangle.

(xi) By using law of cosine, find α when $a=7$, $b=3$, $c=5$

(xii) Prove that $\sin^{-1}x=\dfrac{\pi}{2}-\cos^{-1}x$

(xiii) Solve the trigonometric equation $\cot^2\theta=\dfrac{1}{3}$

Section ---------- II

Note: Attempt any three questions. **(10 × 3 = 30)**

5. **(a)** Use Crammer's Rule to solve the systems of Linear equations

$$\left.\begin{aligned} 3x_1+x_2-x_3 &= -4\\ x_1+x_2-2x_3 &= -4\\ -x_1+2x_2-x_3 &= 1 \end{aligned}\right\}$$

(b) Find the values of a and b if -2 and 2 are the roots of the polynomial x^3-4x^2+ax+b

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

(b) How many terms of the series -9 -6 -3 + 0 + ... amount to 66?

7. **(a)** Find values of n and r when ${}^{n-1}C_{r-1}:{}^{n}C_{r}:{}^{n+1}C_{r+1}=3:6:11$

(b) If $2y=\dfrac{1}{2^2}+\dfrac{1.3}{2!}\dfrac{1}{2^4}+\dfrac{1.3.5}{3!}\dfrac{1}{2^6}+\ldots..$ *then prove that* $4y^2+4y-1=0$

8. **(a)** Prove that $\sin 10^\circ\cdot\sin 30^\circ\cdot\sin 50^\circ\cdot\sin 70^\circ=\dfrac{1}{16}$

(b) Using Law of tangents, solve the ΔABC in which $a=36.21$; $c=30.14$; $\beta=78^\circ 10'$

9 **(a)** If $\operatorname{cosec}\theta=\dfrac{m^2+1}{2m}$; $m>0$; $0<\theta<\pi/2$, then find the values of remaining trigonometric functions.

(b) Prove that $2\tan^{-1}\left(\frac{1}{3}\right)+\tan^{-1}\left(\frac{1}{7}\right)=\pi/4$

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