

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) *SGP-1-24* Group I

Paper (I)

Time Allowed:- 30 minutes

**PAPER CODE 2191**

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 modulus of Complex number  $4 + 5i$  is

(A)  $\sqrt{41}$

(B)  $-\sqrt{41}$

(C)  $\sqrt{31}$

(D)  $-\sqrt{31}$

2) Multiplicative inverse of  $(2, 0)$  is

(A)  $(\frac{1}{2}, 0)$

(B)  $(\frac{1}{2}, -2)$

(C)  $(\frac{1}{4}, 0)$

(D)  $(-\frac{1}{4}, 0)$

3) If  $A \subseteq B$ , then  $A \cap B$  equals

(A) B

(B) A

(C)  $A'$

(D)  $B'$

4) Disjunction of two Logical statements p and q is

(A)  $p \cup q$

(B)  $p \wedge q$

(C)  $p \vee q$

(D)  $p \cap q$

5) The solution of linear equation  $ax = b$  where  $a, b \in G$  is

(A)  $x = ab$

(B)  $x = ab^{-1}$

(C)  $x = a^{-1}b^{-1}$

(D)  $x = a^{-1}b$

6) If  $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$ , then  $A_{23}$  will be

(A) 1

(B) 3

(C) -2

(D) 2

7) For square matrix A, if  $A^t = A$ , then A is called

(A) Symmetric Matrix

(B) Skew Symmetric

(C) Skew Hermitian

(D) Hermitian Matrix

Matrix

8) The product of four fourth root of unity is

(A) 1

(B) -1

(C) 0

(D) 4

9) If  $\alpha$  and  $\beta$  are roots of  $7x^2 - x - 2 = 0$ , then  $\alpha + \beta$  will be

(A)  $-\frac{1}{7}$

(B)  $\frac{1}{7}$

(C)  $\frac{2}{7}$

(D)  $-\frac{2}{7}$

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- 10) Rational fraction  $\frac{x^2 + 2x + 3}{Q(x)}$  will be improper fraction if degree of  $Q(x)$  is  
(A) 3 (B) 4 (C) 2 (D) 5
- 11) If in an A.P.  $a_1 = 11$ ,  $a_n = 68$ ,  $d = 3$ , then  $n$  will be equal to  
(A) 30 (B) -20 (C) -30 (D) 20
- 12) If 3, 9, 27, ... are in G.P. then  $r =$   
(A) 1 (B) 2 (C) 4 (D) 3
- 13) The probability of non-occurrence of event  $E$  is  
(A)  $1 + P(E)$  (B)  $1 - P(E)$  (C)  $1 + P(\bar{E})$  (D)  $P(E) - 1$
- 14) The expansion  $(1 - 3x)^{1/2}$  will be valid if  
(A)  $|x| < \frac{-1}{3}$  (B)  $|x| < 3$  (C)  $|x| < \frac{1}{3}$  (D)  $|x| < -3$
- 15) If  $\cot \theta = \frac{5}{2}$ ;  $0 < \theta < \frac{\pi}{2}$ , then  $\operatorname{cosec}^2 \theta$  is  
(A)  $\frac{-29}{4}$  (B)  $\frac{4}{29}$  (C)  $\frac{29}{4}$  (D)  $\frac{-4}{29}$
- 16)  $\sin(\theta + 270^\circ) =$   
(A)  $\sin \theta$  (B)  $-\sin \theta$  (C)  $\cos \theta$  (D)  $-\cos \theta$
- 17) Period of  $\sin \frac{x}{3}$  is  
(A)  $6\pi$  (B)  $3\pi$  (C)  $-6\pi$  (D)  $-3\pi$
- 18)  $\frac{4\Delta}{abc} =$   
(A)  $\frac{1}{R}$  (B)  $\frac{1}{r}$  (C)  $R$  (D)  $r$
- 19)  $\cos(2 \sin^{-1} x)$  will be equal to:  
(A)  $2x^2 - 1$  (B)  $1 + 2x^2$  (C)  $2x + 1$  (D)  $1 - 2x^2$
- 20) Reference angle always lies in quadrant  
(A) II (B) I (C) III (D) IV

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

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

Section ----- I

2. Answer briefly any Eight parts from the followings:-  $8 \times 2 = 16$

- (i) Prove that  $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$
- (ii) Find the multiplicative inverse of  $(-4, 7)$  (iii) Factorize  $9a^2 + 16b^2$
- (iv) Prove that product of any two conjugate complex numbers is a real number.
- (v) Show that  $A - B \subseteq A \cap B'$
- (vi) Let  $(G, \cdot)$  be a group and  $a, b \in G$ , then prove that  $(a \cdot b)^{-1} = b^{-1} \cdot a^{-1}$
- (vii) If  $A = \begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$ , then find  $A_{12}$  and  $A_{22}$
- (viii) Given A and B are two non singular matrices, show that  $(AB)^{-1} = B^{-1}A^{-1}$
- (ix) If  $A = \begin{bmatrix} i & 1+i \\ 1 & -i \end{bmatrix}$ , then find  $A - (\bar{A})'$  (x) Find the fourth roots of unity.
- (xi) When  $x^3 + 2x^2 + kx + 4$  is divided by  $x - 2$ , then remainder is 14. Find value of  $k$
- (xii) Show that the roots of equation  $x^2 - 2\left(m + \frac{1}{m}\right)x + 3 = 0$  are real where  $m \neq 0$

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

- (i) Resolve  $\frac{x^2 + 1}{(x-1)(x+1)}$  into partial fraction (ii) Define conditional equation.
- (iii) Determine whether -19 is term of A.P 17, 13, 9, ... (iv) Find geometric mean between  $-2i$  and  $8i$
- (v) Sum the infinite geometric series  $4 + 2\sqrt{2} + 2 + \sqrt{2} + \dots$
- (vi) Find 12<sup>th</sup> term of H.P  $\frac{1}{3}, \frac{2}{9}, \frac{1}{6}, \dots$  (vii) Evaluate  ${}^{10}P_7$
- (viii) How many ways can 4 keys be arranged on a circular key ring.
- (ix) How many diagonals can be formed by joining vertices of 5 sided figure
- (x) Expand  $\left(x - 1 - \frac{1}{x}\right)^3$  (xi) Expand upto four terms  $(1+x)^{-3}$
- (xii) Find term involving  $x^5$  in expansion of  $\left(x^2 - \frac{3}{2x}\right)^{10}$

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$$9 \times 2 = 18$$

4. Answer briefly any Nine parts from the followings:-

- (i) Express  $75^\circ$  in radians. (ii) Prove that  $\frac{\sin \theta}{1 + \cos \theta} + \cot \theta = \operatorname{cosec} \theta$
- (iii) If  $\alpha, \beta, \gamma$  are angles of a triangle, then prove that  $\cos\left(\frac{\alpha + \beta}{2}\right) = \sin \frac{\gamma}{2}$
- (iv) Without using calculator, find the value of  $\tan 105^\circ$ .
- (v) Prove that  $\frac{1 - \cos \alpha}{\sin \alpha} = \tan \frac{\alpha}{2}$  (vi) Write the domain and range of  $y = \cos x$
- (vii) Define periodicity. (viii) Find the period of  $3\cos \frac{x}{5}$
- (ix) At the top of a cliff 80 m high, the angle of depression of a boat is  $12^\circ$ . How far is the boat from the cliff?
- (x) Find area of a triangle ABC in which  $a = 18$ ,  $b = 24$ ,  $c = 30$
- (xi) Show that  $r_2 = s \tan \frac{\beta}{2}$
- (xii) Show that  $\cos(\sin^{-1} x) = \sqrt{1 - x^2}$  (xiii) Solve the equation  $1 + \cos x = 0$  for general solution.

Section ----- II

Note: Attempt any three questions.

$$(10 \times 3 = 30)$$

5. (a) Find the inverse of the matrix  $A = \begin{bmatrix} 2 & 5 & -1 \\ 3 & 4 & 2 \\ 1 & 2 & -2 \end{bmatrix}$
- (b) Solve the system of equations  $y^2 - 7 = 2xy$   
 $2x^2 + 3 = xy$
6. (a) Resolve  $\frac{x^3}{1 - x^4}$  into Partial Fractions.
- (b) The A.M of two positive integral numbers exceeds their (positive) G.M by 2 and their sum is 20, find the numbers.
7. (a) Prove that  ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^nC_r$
- (b) If  $y = \frac{1}{3} + \frac{1.3}{2!}\left(\frac{1}{3}\right)^2 + \frac{1.3.5}{3!}\left(\frac{1}{3}\right)^3 + \dots$  then prove that  $y^2 + 2y - 2 = 0$
8. (a) Reduce  $\cos^4 \theta$  to an expression involving only function of multiples of  $\theta$ , raised to the first power.
- (b) Prove that  $r_1 + r_2 + r_3 - r = 4R$
9. (a) Prove that  $\frac{1 - \sin \theta}{1 + \sin \theta} = \sec \theta - \tan \theta$ , where  $\theta$  is not an odd multiple of  $\frac{\pi}{2}$
- (b) Prove that  $\sin^{-1} \frac{77}{85} - \sin^{-1} \frac{3}{5} = \cos^{-1} \frac{15}{17}$