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

Mathematics (Objective) SGD-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) $\left(\frac{1}{2}, 0\right)$ (B) $\left(\frac{1}{2}, -2\right)$ (C) $\left(\frac{1}{4}, 0\right)$ (D) $\left(-\frac{1}{4}, 0\right)$

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 Matrix (C) Skew Hermitian (D) Hermitian Matrix

8) The product of four fourth root of unity is

(A) 1 (B) -1 (C) 0 (D) 4

9) If α and β 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 $\cot\theta = 5/2$; $0 < \theta < \frac{\pi}{2}$, 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) 6π (B) 3π (C) -6π (D) -3π

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 × 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 $A-(\overline{A})'$ **(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 × 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 $4+2\sqrt{2}+2+\sqrt{2}+...$

(vi) Find 12th term of H.P $\frac{1}{3},\frac{2}{9},\frac{1}{6},...$ **(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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4. Answer briefly any Nine parts from the followings:- **9 × 2 = 18**

(i) Express 75° in radians.

(ii) Prove that $\frac{\sin\theta}{1+\cos\theta} + \cot\theta = \operatorname{cosec}\theta$

(iii) If α, β, γ 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°. 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 × 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 $\frac{x^4}{1-x^4}$ 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 $y = \frac{1}{3} + \frac{1.3}{2!}\left(\frac{1}{3}\right)^2 + \frac{1.3.5}{3!}\left(\frac{1}{3}\right)^3 + \ldots$ then prove that $y^2 + 2y - 2 = 0$

8. (a) Reduce $\cos^4\theta$ to an expression involving only function of multiples of θ, raised to the first power.

(b) Prove that $r_1 + r_2 + r_3 - r = 4R$

9 (a) Prove that $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$, where θ is not an odd multiple of $\frac{\pi}{2}$

(b) Prove that $\sin^{-1}\frac{77}{85} - \sin^{-1}\frac{3}{5} = \cos^{-1}\frac{15}{17}$

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(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

SLD-2-24

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]

(13)
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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 $\left(\frac{a}{2}-\frac{2}{a}\right)^6$

(14) II

SGD-2-24

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 $\cos 330^o \sin 600^o + \cos 120^o \sin 150^o = -1$

(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 $\sin 10^o\cdot\sin 30^o\cdot\sin 50^o\cdot\sin 70^o=\dfrac{1}{16}$

(b) Using Law of tangents, solve the ΔABC in which $a=36.21$; $c=30.14$; $\beta=78^o10'$

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

(20)