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

Mathematics (Objective) **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) $-\frac{2}{7}$

P.T.O 1125 -- 1124 -- 11000(1)

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) $\sin(\theta + 270^o) =$

(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

1125 -- 1124 -- 11000 (1)

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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 $4+2\sqrt{2}+2+\sqrt{2}+\ldots$

(vi) Find 12^{th} term of H.P $\frac{1}{3},\frac{2}{9},\frac{1}{6},\ldots$ **(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 $\left(x^2-\frac{3}{2x}\right)^{10}$

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 **(10 × 3 = 30)**

Note: Attempt any three questions.

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) 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

P.T.O 1127 -- 1124 -- 11000 (4)

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) $n(n-1)(n-2)(n-3)\ldots(n-r+1) =$

(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]

1127 -- 1124 -- 11000 (4)

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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.

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

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

(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 $a = 36.21$; $c = 30.14$; $\beta = 78^o 10'$

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

1128 -- 1124 -- 11000

Sargodha Board-2023

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(Inter Part – I) (Session 2019-21 to 2022-24) Sig. of Student ----------
Mathematics (Objective) Group I Paper (I)
Time Allowed:- 30 minutes PAPER CODE 2193 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) No term of geometric sequence can be:

(A) Zero (B) 1 (C) 2 (D) 3

2) Multiplicative inverse of $-i$ is

(A) i (B) $-i$ (C) 1 (D) -1

3) A function f: A→ B is surjective if:

(A) Range f =A (B) Range of f = B (C) Range f ≠ A (D) Range f ≠ B

4) The co-factor of an element a_{ij} denoted by A_{ij}= ____.

(A) $(-1)^{ij} M_{ij}$ (B) $(-1)^{i-j} M_{ij}$ (C) $(-1)^{i+j} M_{ij}$ (D) $(1)^{i+j} M_{ij}$

5) For a non-singular matrix A, if $AX = B, then\ X =$ ____.

(A) $A^{-1}B$ (B) BA^{-1} (C) $(AB)^{-1}$ (D) $(BA)^{-1}$

6) The polynomial $3x^2 + 2x + 1$ has degree:

(A) 0 (B) 3 (C) 2 (D) 4

7) A quadratic equation $ax^2 + bx + c = 0$ becomes linear equation if:

(A) $a = 0, b \neq 0$ (B) $c = 0\ a \neq 0$ (C) $a \neq 0, b = 0$ (D) $a = b = 0$

8) Any improper fraction can be reduced to a mixed form by:

(A) Addition (B) Multiplication (C) Division (D) Factorization

9) If $a_{n-3} = 2n - 5$. Then 7th term is:

(A) 9 (B) 11 (C) 15 (D) 13

P.T.O 1117 -- 1123 -- 11000 (2)

10) If $\cos x = \frac{1}{\sqrt{2}}$. Then reference angle is:

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

11) The value of 4! 0! 1! is:

(A) 0 (B) 1 (C) 4 (D) 24

12) ${}^{n}C_{0}$ equals:

(A) ${}^{n}P_{2}$ (B) ${}^{n}C_{n}$ (C) ${}^{n}C_{2}$ (D) ${}^{n}C_{n+1}$

13) In expansion of $(a+b)^7$, the 2nd term is:

(A) a^7 (B) 7ab (C) $7a^6b$ (D) zero

14) The sum of even co-efficients in the Binomial expansion of $(1+x)^n$ is equal to:

(A) 2^{n-1} (B) 2^{n+1} (C) 2^n (D) 2^n-1

15) One radian is equal to:

(A) 57.296^o (B) 57^o (C) 56^o (D) 0.0175^o

16) *If* $\sin x = \cos x$ *. Then* $x =$ ——

(A) 30^o (B) 0^o (C) 45^o (D) 60^o

17) Range of cotagent function is:

(A) N (B) Z (C) R (D) C

18) If ΔABC be any triangle and $\gamma = 90^\circ$. Then:

(A) $c^2 = a^2 + b^2$ (B) $b^2 = a^2 + c^2$ (C) $a^2 = b^2 + c^2$ (D) $a^2 + b^2 = 0$

19) $b^2 + c^2 - 2bc\cos\alpha$ equal to:

(A) Δ (B) 0 (C) a^2 (D) b^2

20) $\cos(2\sin^{-1}x)$ is equal to:

(A) $\sqrt{1+x^2}$ (B) $\sqrt{1-x^2}$ (C) $\sqrt{1+2x^2}$ (D) $1-2x^2$

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Mathematics (Subjective) (Session 2019-21 to 2022-24) 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) Show that $\forall\, z_1, z_2 \in C,\ \overline{z_1 z_2} = \bar{z}_1 \bar{z}_2$.

(ii) Simplify by justifying each step $\dfrac{\frac{a}{b}+\frac{c}{d}}{\frac{a}{b}-\frac{c}{d}}$ (iii) Write down the power set of the set $\{+, -, \times, \div\}$

(iv) Prove that $p \vee (\sim p \wedge \sim q) \vee (p \wedge q) = p \vee (\sim p \wedge \sim q)$

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

(vi) Find x *and* y *if* $\begin{bmatrix} 2 & 0 & x \\ 1 & y & 3 \end{bmatrix} + 2\begin{bmatrix} 1 & x & y \\ 0 & 2 & -1 \end{bmatrix} = \begin{bmatrix} 4 & -2 & 3 \\ 1 & 6 & 1 \end{bmatrix}$

(vii) If $A = [a_{ij}]_{3\times 4}$ then show that $AI_4 = A$ (viii) If $A = \begin{bmatrix} 1 & 2 & 0 \\ 3 & 2 & -1 \\ -1 & 3 & 2 \end{bmatrix}$ Show that $A - A^t$ is Skew Symmetric.

(ix) Evaluate $\omega^{28} + \omega^{29} + 1$ (x) If α, β are roots of $3x^2 - 2x + 4 = 0$ Find value of $\alpha^2 - \beta^2$

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

(xii) Solve the system of equations $(x - 3)^2 + y^2 = 5,\ 2x = y + 6$

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

(i) Without finding unknown constants, write partial fraction form of $\dfrac{3x^2 - 4x - 5}{(x-2)(x^2 + 7x + 10)}$

(ii) Write 21st and 26th terms of the sequence whose general term is $(-1)^{n+1}$

(iii) Find the 18th term of the A.P if its 6th term is 19 and 9th term is 31.

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

(v) If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in G.P, show that common ratio is $\pm\sqrt{\frac{a}{c}}$.

(vi) If $y = 1 + \frac{x}{2} + \frac{x^2}{4} + \cdots$, *then show that* $x = \frac{2(y-1)}{y}$.

(vii) Write $\frac{8.7.6}{3.2.1}$ in the factorial form.

(viii) Find the value of n when ${}^{11}P_n = 11.10.9$

(ix) In how many ways can 4 keys be arranged on a circular key ring?

(x) Show that $\frac{n^3+2n}{3}$ represents an integer for n = 2 , 3.

(xi) Find the term independent of x in the expansion of $\left(x - \frac{2}{x}\right)^{10}$.

(xii) Use binomial theorem to find the value of $\sqrt[5]{31}$ to three places of decimal.

Sargodha Board-2023

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

(i) What is the length of the arc intercepted on a circle of radius 14 cms by the arms of a central angle of $45°$

(ii) Verify that $sin^2\frac{\pi}{6} + sin^2\frac{\pi}{3} + tan^2\frac{\pi}{4} = 2$.

(iii) Prove the identity $(sec\theta + tan\theta)(sec\theta - tan\theta) = 1$

(iv) If α, β, γ *are the angles of a triangle ABC then prove that* $cos\left(\frac{\alpha+\beta}{2}\right) = sin\frac{\gamma}{2}$.

(v) Prove that $\frac{\cos 8° - \sin 8°}{\cos 8° + \sin 8°} = tan\ 37°$ **(vi)** Express $sin\ 8\theta - sin\ 4\theta$ as product.

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

(viii) A kite flying at height of 67.2 m is attached to a fully stretched string inclined at an angle of 55° to the horizontal, Find the length of the string.

(ix) Find the smallest angle of the triangle ABC when a = 37.34 , b = 3.24, c = 35.06.

(x) Find r_1 *and* r_2 if measure of the sides of triangle ABC are a=34, b=20, c=42.

(xi) Prove that $tan^{-1}\frac{1}{4} + tan^{-1}\frac{1}{5} = tan^{-1}\frac{9}{19}$

(xii) Find the solution of the equation $\sin x = -\frac{\sqrt{3}}{2}$ which lies in $[0, 2\pi]$

(xiii) Find the value of θ satisfying equation $2sin^2\theta - sin\theta = 0$ in $[0, 2\pi]$.

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

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

5. (a) Show that $\begin{vmatrix} x & 1 & 1 & 1 \\ 1 & x & 1 & 1 \\ 1 & 1 & x & 1 \\ 1 & 1 & 1 & x \end{vmatrix} = (x+3)(x-1)^3$

(b) Solve the following system of equations $12x^2 - 11xy + 2y^2 = 0$, $2x^2 + 7xy = 60$

6. (a) Resolve into partial fractions $\frac{x}{(x-a)(x-b)(x-c)}$

(b) How many numbers greater than 1000,000 can be formed from the digits 0,2,2,2,3,4,4?

7. (a) Sum the series $2+(1-i) + \left(\frac{1}{i}\right) +$.....to 8 terms.

(b) Find the coefficient of ; x^5 in the expansion of $\left(x^2 - \frac{3}{2x}\right)^{10}$

8. (a) Prove that $sin^6\theta + cos^6\theta = 1 - 3\ sin^2\theta\ cos^2\theta$

(b) If $\alpha + \beta + \gamma = 180°, show\ that\ cot\alpha.cot\beta + cot\beta.cot\gamma + cot\gamma.cot\alpha = 1$

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

(b) Prove that $\sin^{-1}\left(\frac{5}{13}\right) + \sin^{-1}\left(\frac{7}{25}\right) = \cos^{-1}\left(\frac{253}{325}\right)$

Sargodha Board-2023

1123 **Warning:- Please write your Roll No. in the space provided and sign.** Roll No----------

(Inter Part – I) **(Session 2019-21 to 2022-24)** Sig. of Student ----------

Mathematics (Objective) **(Group-II)** **Paper (I)**

Time Allowed:- 30 minutes **PAPER CODE 2194** **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) If $\frac{1}{k}, \frac{1}{2k+1}, \frac{1}{4k-1}$ are in H.P, then k equals.

(A) 3 (B) 4 (C) 2 (D) 1

2) The real part of $\frac{1+3i}{2i}$ equals

(A) $^2/_3$ (B) $^3/_2$ (C) 1 (D) 2

3) The conjunction of two logical statements p *and* q is denoted by:

(A) $p \wedge q$ (B) $p \vee q$ (C) $\sim p \rightarrow q$ (D) $p \rightarrow q$

4) Let A= $[a_{ij}]_{3\times4}$, then number of elements in A are.

(A) 3 (B) 4 (C) 7 (D) 12

5) If 'A' is a symmetric matrix, then A^2 will also be

(A) Hermitian (B) Skew Hermitian (C) Symmetric (D) Skew Symmetric

6) '$x-1$' is a factor of polynomial.

(A) x^2+4x+3 (B) x^2+4x-3 (C) x^2+4x+5 (D) x^2+4x-5

7) If the roots of equation $ax^2+bx+c=0$ are real and equal, then b^2-4ac will be

(A) 0 (B) a (C) b (D) c

8) The proper rational fraction is

(A) $\frac{x^2+1}{(x-1)(x-2)}$ (B) $\frac{x}{(x-1)(x-2)}$ (C) $\frac{x^2}{(x-1)(x-2)}$ (D) $\frac{x^2+3}{(x-1)(x-2)}$

9) If $\frac{a^n+b^n}{a^{n-1}+b^{n-1}}$ is A.Ms between a and b, then n will be equal to.

(A) 0 (B) 2 (C) 1 (D) 3

10) Solution of $\cot\theta = \frac{1}{\sqrt{3}}$ in Ist quadrant will be.

(A) $\pi/3$ (B) $\pi/2$ (C) $\pi/4$ (D) $\pi/6$

11) If A and B are two independent events, then $P(A \cap B)$ will be.

(A) $P(A) + P(B)$ (B) $P(A) - P(B)$ (C) $P(A).P(B)$ (D) $\frac{P(A)}{P(B)}$

12) If ${}^{n}C_{12} = {}^{n}C_{8}$, then n equals.

(A) 8 (B) 12 (C) 16 (D) 20

13) The sum of odd co-efficients in the expansion of $(1+x)^n$ is equal to.

(A) 2 (B) 2^{n-1} (C) 3^n (D) 4^n

14) 2^{nd} term in the expansion of $(4-3x)^{1/2}$ is

(A) $\frac{3x}{2}$ (B) $-\frac{3x}{2}$ (C) $-\frac{3x}{4}$ (D) $\frac{3x}{4}$

15) $Sin^2\pi/6 + Sin^2\pi/3 + tan^2\pi/4$ is equal to.

(A) 2 (B) 0 (C) 3 (D) 4

16) $\frac{2tan\theta}{1+tan^2\theta}$ will be equal to.

(A) $sin\theta$ (B) $Cos\theta$ (C) $Cos2\theta$ (D) $sin2\theta$

17) Period of Cot $x/2$ is

(A) $\pi/2$ (B) 2π (C) 4π (D) π

18) $\frac{a}{sin\alpha} = \frac{b}{sin\beta} = \frac{c}{sin\gamma}$ is called

(A) Cosines law (B) Sines law (C) Tangents law (D) Half angle law

19) In equilateral triangle having side 3, 'R' will be euqal to

(A) 2 (B) $2\sqrt{3}$ (C) 3 (D) $\sqrt{3}$

20) The value of Sin $(Cos^{-1}x)$ equals

(A) $x\sqrt{1+x^2}$ (B) $x\sqrt{1-x^2}$ (C) $\sqrt{1-x^2}$ (D) $\sqrt{1+x^2}$

1123 Warning:- Please, do not write anything on this question paper except your Roll No.

Mathematics (Subjective) (Session 2019-21 to 2022-24) 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) Define additive identity and additive inverse properties of real numbers.

(ii) Prove $\sqrt{3}$ is an irrational number. **(iii)** Define Aristotlian Logic.

(iv) Write converse and inverse of $\sim p \rightarrow q$.

(v) Give the table for addition of elements of the set of residue classes modulo 4.

(vi) Define rectangular matrix with example. **(vii)** If $A=\begin{bmatrix}5 & 3\\ 1 & 1\end{bmatrix}$, find its multiplicative inverse.

(viii) If $B=\begin{bmatrix}5 & -2 & 5\\ 3 & -1 & 4\\ -2 & 1 & -2\end{bmatrix}$ find B_{22} and B_{23}

(ix) Find two consecutive numbers whose product is 132.

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

(xi) Define Remainder theorem. **(xii)** Find Four fourth roots of 625.

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

(i) Resolve $\frac{1}{x^2-1}$ into partial fractions. **(ii)** If $S_n = n(2n-1)$, then find the Arithmetic series.

(iii) How many terms of the series -7+(-5)+(-3)+.... amount to 65?

(iv) Insert two G.Ms between 2 and 16.

(v) Find A,G,H if a=-2, b=-8, G<0 and verify that A<G<H.

(vi) Find the sum of the infinite geometric series $\frac{1}{5}+\frac{1}{25}+\frac{1}{125}+\cdots$

(vii) How many ways can 4 keys be arranged on a circular key ring.

(viii) Find the value of 'n' if ${}^{n}C_8 = {}^{n}C_{12}$ **(ix)** Define Sample Space and Events.

(x) Show that $\frac{n^3+2n}{3}$ represents an integer for n=1,2.

(xi) Find the term independent of 'x' in the expansion of $\left(x-\frac{2}{x}\right)^{10}$.

(xii) Expand $(1-x)^{-3}$ upto 4 terms.

Sargodha Board-2023

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

(i) Convert the angle $\theta = 21.256^\circ$ *to* $D^\circ M' S''$ form. **(ii)** Define angle in standard position with figure.

(iii) Verify $cos2\theta = 2cos^2\theta - 1$. *when* $\theta = 30^\circ, 45^\circ$.

(iv) Show that $\frac{tan\alpha+tan\beta}{tan\alpha-tan\beta} = \frac{Sin(\alpha+\beta)}{Sin(\alpha-\beta)}$

(v) Express cos *(x+y)* sin *(x-y)* as sum or difference.

(vi) By using fundamental Law of trigonometry, show that $(\sin\frac{\pi}{2} + \alpha) = cos\alpha$.

(vii) Find the period of $\sin\frac{x}{5}$. **(viii)** Solve the triangle ABC in which $\gamma = 90^\circ \quad a = 3.28 \quad b = 5.74$.

(ix) The area of triangle is 2437, if a=79 , c=97 . Then find angle β.

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

(xi) Evaluate without using calculator, $cos^{-1}(-\frac{1}{2})$ **(xii)** Solve $sin^2 x + cos\, x = 1$ *where* $x \in [0,2\pi]$.

(xiii) Define Trigonometric equation.

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

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

5. (a) Find inverse of $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{bmatrix}$ and show that $A^{-1}A = I_3$

(b) If α, β *are roots of* $px^2 + qx + q = 0$ then prove that $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{q}{p}} = 0$.

6. (a) Resolve $\frac{9x-7}{(x^2+1)(x+3)}$ into partial fractions.

(b) Prove that ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$.

7. (a) If $y = \frac{2}{3}x + \frac{4}{9}x^2 + \frac{8}{27}x^3 + \ldots\ldots$ and if $0 < x < 3/2$ *then show that* $x = \frac{3y}{2(1+y)}$

(b) Find the coefficient of x^5 in the expansion of $\left(x^2 - \frac{3}{2x}\right)^{10}$

8. (a) Show that the area of a sector of a circular region of radius r *is* $\frac{1}{2}r^2\theta$, where θ is the circular measure of the central angle of the sector.

(b) Prove that $sin\frac{\pi}{9} sin\frac{2\pi}{9} sin\frac{\pi}{3} sin\frac{4\pi}{9} = \frac{3}{16}$

9 (a) Prove that: $abc(sin\alpha + sin\beta + sin\gamma) = 4\Delta s$.

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

Sargodha Board-2021

1121 Warning:- Please write your Roll No. in the space provided and sign. Roll No----------
(Inter Part – I) (Session 2017-19 to 2020-22) Sig. of Student ----------

Mathematics (Objective) **(Group I)** **Paper (I)**

Time Allowed:- 30 minutes **PAPER CODE 2193** 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) A.M between $\sqrt{2}$ and $3\sqrt{2}$ is

(A) $\sqrt{2}$ (B) $3\sqrt{2}$ (C) $\frac{4}{\sqrt{2}}$ (D) $\frac{\sqrt{2}}{2}$

2) Which of the following is an irrational number?

(A) $\sqrt{\frac{68}{17}}$ (B) $\frac{\sqrt{16}}{7}$ (C) $\frac{4}{\sqrt{2}}$ (D) $\sqrt{\frac{3}{27}}$

3) If a set S has 5 elements, Then number of improper subsets are

(A) 1 (B) 15 (C) 31 (D) 32

4) The co-factor A_{22} of the matrix $\begin{bmatrix} 1 & 2 & 4 \\ -1 & 2 & 5 \\ 0 & 1 & -1 \end{bmatrix}$ is

(A) 0 (B) -1 (C) 1 (D) 2

5) The matrix $\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 4 \\ 0 & 0 & 6 \end{bmatrix}$ is

(A) Diagonal (B) Scalar (C) Triangular (D) Singular

6) The quadratic equation $ax^2 + bx + c = 0$ becomes Linear equation if

(A) $a = 0$ (B) $b = 0$ (C) $c = 0$ (D) $a = b$

7) If ω is complex roots of unity, Then value of $(3+\omega)(3+\omega^2) =$

(A) 6 (B) 7 (C) 9 (D) 13

8) If $\frac{7x+25}{(x+3)(x+4)} = \frac{A}{x+3} + \frac{B}{x+4}$, Then value of B is

(A) 3 (B) -3 (C) 4 (D) -4

9) G.M between 1 and 16 is/are

(A) 4 (B) -4 (C) ± 4 (D) $\pm\frac{1}{4}$

10) Solution of the equation $\cos x = -1$ in $[0, 2\pi]$ is

(A) $\left\{0, \frac{\pi}{2}\right\}$ (B) $\{\pi\}$ (C) $\left\{\frac{-\pi}{2}, \frac{\pi}{2}\right\}$ (D) $\left\{\frac{\pi}{2}\right\}$

11) $(-1)^n$, $n \in N$ is a/an

(A) A.P (B) G.P (C) H.P (D) Series

12) A die is rolled, The probability of getting 3 or an Even number is

(A) $\frac{1}{12}$ (B) $\frac{1}{2}$ (C) $\frac{1}{3}$ (D) $\frac{2}{3}$

13) Middle Term (S) of $(a+b)^{11}$ is/are

(A) 6^{th} (B) 5^{th} & 6^{th} (C) 6^{th} & 7^{th} (D) 5^{th}

14) $2\sin 45^o + \frac{1}{2}\operatorname{cosec} 45^o =$

(A) 1 (B) -1 (C) $\sqrt{\frac{2}{3}}$ (D) $\frac{3}{\sqrt{2}}$

15) If $\tan\theta > 0$, $\sin\theta < 0$, Then terminal arm of the angle θ will lie in quadrant

(A) I (B) II (C) III (D) IV

16) If $\alpha = 30^o$, then value of $\cot 3\alpha =$

(A) 0 (B) 1 (C) 3 (D) ∞

17) The period of cosec $10x$ is

(A) $\frac{\pi}{10}$ (B) $\frac{2\pi}{5}$ (C) $\frac{4\pi}{5}$ (D) $\frac{\pi}{5}$

18) If α, β *and* γ are the angles of an oblique Triangle, then it must be true that

(A) $\alpha = 90^o$ (B) $\beta = 90^o$ (C) $\gamma = 90^o$ (D) No angle is 90^o

19) In any Triangle ABC, with usual notations, $\frac{a}{2\sin\alpha} =$

(A) Δ (B) r (C) 2R (D) R

20) $\sin\left(\sin^{-1}\left(\frac{1}{2}\right)\right) =$

(A) $\frac{1}{2}$ (B) $\frac{-1}{2}$ (C) $\frac{\pi}{3}$ (D) $\pi/6$

1121 Warning:- Please, do not write anything on this question paper except your Roll No.

Mathematics (Subjective) (Session 2017-19 to 2020-22) 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 $\frac{-7}{12}-\frac{5}{18}=\frac{-21-10}{36}$ **(ii)** Simplify (5 , -4)(-3 , -2)

(iii) Find the multiplicative Inverse of $1-2i$. **(iv)** Show that the statement $P \to (p \vee q)$ is tautology.

(v) Find the inverse of the relation $\{(x, y) \mid y^2 = 4ax\ ,\ x \geq 0\}$

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

(vii) Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$ **(viii)** Without expansion show that $\begin{vmatrix} 6 & 7 & 8 \\ 3 & 4 & 5 \\ 2 & 3 & 4 \end{vmatrix} = 0$

(ix) If $A = \begin{vmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{vmatrix}$, find A_{12} and A_{22} **(x)** Evaluate $(1+\omega-\omega^2)^8$

(xi) If α , β are the roots of the equation $3x^2 - 2x + 4 = 0$, find the value of $\alpha^3 + \beta^3$

(xii) Show that the roots of equation $px^2 - (p - q)x - q = 0$ will be rational.

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

(i) Write only partial Fraction Form of $\frac{x^2-2x+3}{x^4+x^2+1}$ without finding constants

(ii) Resolve $\frac{7x+25}{(x+3)(x+4)}$ into Partial Fraction.

(iii) If the nth term of an A.P is 3n-1 Find the A.P **(iv)** Find the 5^{th} term of the G.P 3,6,12,....

(v) Find the sum of an infinite geometric series $\frac{9}{4}+\frac{3}{2}+1+\frac{2}{3}+.....$

(vi) If the numbers $\frac{1}{k}$, $\frac{1}{2k+1}$ *and* $\frac{1}{4k-1}$ are in Harmonic Sequence, find k

(vii) Write (n + 2)(n + 1)(n) in the Factorial Form

(viii) How many 3-digit numbers can be Formed by using each one of the digits 2,3,5,7,9 only once?

(ix) If ${}^nC_8 = {}^nC_{12}$, find n **(x)** Prove the Formula $1 + 5 + 9 + \ldots + (4n - 3) = n(2n - 1)$ For n = 1 , 2

(xi) Calculate $(0.97)^3$ by means of binomial theorem. **(xii)** Expand $(4-3x)^{\frac{1}{2}}$ upto 4-terms

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

(i) What is the circular measure of the angle between the hands of a watch at 4'O clock?

(ii) In which quadrant the terminal arms of the angle lie when $\sec\theta < 0$ *and* $\sin\theta < 0$

(iii) Prove that $\cos^2\theta - \sin^2\theta = \dfrac{1-\tan^2\theta}{1+\tan^2\theta}$ **(iv)** Find the value of $\tan\ (1110)^\circ$

(v) Prove that $1+\tan\alpha\tan(2\alpha) = \sec(2\alpha)$ **(vi)** Show that $\cot(\alpha-\beta) = \dfrac{\cot\alpha\cot\beta+1}{\cot\beta-\cot\alpha}$

(vii) Find the period of $\cos(2x)$ **(viii)** Find the value of $\tan 19°30'$

(ix) Find the area of the triangle ABC given three sides: a = 32.65 , b = 42.81 , c = 64.92

(x) Find the value of r if a = 34 , b = 20 and c = 42

(xi) Without using table/calculator Prove that $\tan^{-1}\left(\frac{5}{12}\right) = \sin^{-1}\left(\frac{5}{13}\right)$

(xii) Find the value of θ satisfying $2\sin^2\theta - \sin\theta = 0$; $\theta \in [0, 2\pi]$

(xiii) Find the solution of $\operatorname{cosec}\theta = 2$

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

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

5. (a) Show that $\begin{vmatrix} x & 1 & 1 & 1 \\ 1 & x & 1 & 1 \\ 1 & 1 & x & 1 \\ 1 & 1 & 1 & x \end{vmatrix} = (x+3)(x-1)^3$

(b) Show that the roots of $x^2 + (mx + c)^2 = a^2$ will be equal if $c^2 = a^2(1 + m^2)$

6. (a) Resolve into partial fraction $\dfrac{6x^3+5x^2-7}{2x^2-x-1}$

(b) The sum of 9 terms of an A.P is 171 and its eighth term is 31. Find the series.

7. (a) Prove that ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

(b) Use mathematical induction to prove that the formula $1+\frac{1}{2}+\frac{1}{4}+\ldots+\frac{1}{2^{n-1}} = 2\left[1-\frac{1}{2^n}\right]$ is true for every positive integer n.

8. (a) Prove that $\sin^6\theta - \cos^6\theta = (\sin^2\theta - \cos^2\theta)(1 - \sin^2\theta\cos^2\theta)$

(b) Prove that $\dfrac{\sin\theta+\sin3\theta+\sin5\theta+\sin7\theta}{\cos\theta+\cos3\theta+\cos5\theta+\cos7\theta} = \tan4\theta$

9 (a) Prove that $abc(\sin\alpha+\sin\beta+\sin\gamma) = 4\Delta s$

(b) Prove that $\sin^{-1}\left(\frac{5}{13}\right)+\sin^{-1}\left(\frac{7}{25}\right) = \cos^{-1}\left(\frac{253}{325}\right)$

1121 Warning:- Please write your Roll No. in the space provided and sign. Roll No----------
(Inter Part – I) (Session 2017-19 to 2020-22) Sig. of Student ----------

Mathematics (Objective) **Group II** **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) Partial fraction of $\frac{1}{(x+1)(x^2-1)}$ will be of the form

(A) $\frac{A}{x+1}+\frac{Bx+c}{x^2-1}$ (B) $\frac{A}{x+1}$ (C) $\frac{A}{x+1}+\frac{B}{x-1}+\frac{Cx+D}{(x+1)^2}$ (D) $\frac{A}{x+1}+\frac{Bx+C}{x^2+1}$

2) Arithmetic mean between a and b is

(A) $\frac{a-b}{2}$ (B) $\pm\sqrt{ab}$ (C) $\frac{2ab}{a+b}$ (D) $\frac{a+b}{2}$

3) If $a_n=(-1)^n(2n-3)$ Then $a_5=$

(A) 7 (B) -7 (C) 13 (D) -13

4) Multiplicative inverse of $-i$ is

(A) i (B) $-i$ (C) 1 (D) -1

5) Tabular form of $\{x \mid x \in E \wedge -4 < x < 6\}$ is

(A) { } (B) { 4 } (C) { 6 } (D) { 4 , 6 }

6) If $A=\begin{bmatrix}1 & 2 & -2\\ 0 & 0 & 6\\ 6 & 7 & 4\end{bmatrix}$ then $A_{33}=$

(A) -1 (B) 1 (C) -2 (D) 0

7) A matrix of order $l \times n$ is called

(A) Row matrix (B) Column matrix (C) Diagonal matrix (D) Null matrix

8) If one root of equation $x^2+px+q=0$ is additive inverse of other, then

(A) p = -1 (B) p = 0 (C) q = 1 (D) q = 0

9) If ω is cube root of unity, then $\omega+\omega^2=$

(A) 0 (B) -1 (C) 1 (D) $\frac{1}{\omega}$

10) In any Triangle ABC, with usual notation, $\frac{b-c}{b+c} =$

(A) $\frac{\tan\frac{\beta-\gamma}{2}}{\tan\frac{\beta+\gamma}{2}}$ (B) $\frac{\tan\frac{\beta+\gamma}{2}}{\tan\frac{\beta-\gamma}{2}}$ (C) $\frac{\tan\frac{\alpha-\gamma}{2}}{\tan\frac{\alpha+\gamma}{2}}$ (D) $\frac{\tan\frac{\alpha+\beta}{2}}{\tan\left(\frac{\alpha-\beta}{2}\right)}$

11) *Value of* $\sec\left(\sin^{-1}\frac{\sqrt{3}}{2}\right) =$

(A) $\frac{1}{2}$ (B) 2 (C) $\frac{\sqrt{3}}{2}$ (D) $\frac{1}{\sqrt{2}}$

12) If $\text{Sin}\, x = \text{Cos}\, x$ then $x =$

(A) 45^o (B) 30^o (C) 0^o (D) 60^o

13) G.M between $2i$ and $8i$ equals

(A) ± 4 (B) $5i$ (C) -4 (D) $\pm 4i$

14) For independent events $P(A \cap B) =$

(A) $P(A)+P(B)$ (B) $P(A)-P(B)$ (C) $P(A).P(B)$ (D) $\frac{P(A)}{P(B)}$

15) Expansion of $(1-2x)^{1/3}$ is valid if

(A) $|x|<1$ (B) $|x|<1/3$ (C) $|x|<2$ (D) $|x|<\frac{1}{2}$

16) $Cot^2\theta - Co\sec^2\theta =$

(A) 1 (B) -1 (C) 0 (D) 2

17) $\text{Cos}(-60^o) =$

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$ (C) $\frac{\sqrt{3}}{2}$ (D) $\frac{-\sqrt{3}}{2}$

18) $\text{Cos}2\alpha =$

(A) $2\text{Sin}^2\alpha$ -1 (B) $2\text{Cos}^2\alpha$ -1 (C) $2\text{Cos}\frac{\alpha}{2}Sin\frac{\alpha}{2}$ (D) $1-2\text{Cos}^2\alpha$

19) Period of Cot $8x$ is

(A) 8π (B) $\frac{\pi}{8}$ (C) $\frac{\pi}{4}$ (D) π

20) $\text{Cot}\frac{\alpha}{2} =$

(A) $\sqrt{\frac{s(s-c)}{(s-b)(s-a)}}$ (B) $\sqrt{\frac{s(s-a)}{(s-b)(s-c)}}$ (C) $\sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$ (D) $\sqrt{\frac{s(s-a)}{(s-b)(s-c)}}$

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Mathematics (Subjective) (Session 2017-19 to 2020-22) 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) Find the multiplicative inverse of (-4 , 7) **(ii)** Show that $\forall z_1, z_2 \in C$, $\overline{z_1 + z_2} = \bar{z}_1 + \bar{z}_2$

(iii) Find the difference of the complex numbers (8 , 9) and (5 , -6)

(iv) Show that the statement $(p \wedge q) \rightarrow p$ is a tautology **(v)** If $A=\{a, \{b, c\}\}$, then find P(A).

(vi) Write the set builder notation of the set. $\{0, \pm 1, \pm 2, \ldots \pm 1000\}$

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

(viii) Show that $\begin{vmatrix} a+l & a & a \\ a & a+l & a \\ a & a & a+l \end{vmatrix} = l^2(3a+l)$ **(ix)** If $A=\begin{bmatrix} 4 & \lambda & 3 \\ 7 & 3 & 6 \\ 2 & 3 & 1 \end{bmatrix}$ is singular. Find the value of λ

(x) Evaluate $(1+\omega-\omega^2)^8$

(xi) Find the roots of the equation: $16x^2+8x+1=0$ by using Quadratic formula.

(xii) By using remainder theorem, find the remainder when the polynomial x^2+3x+7 is divided by $x+1$

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

(i) Resolve into Partial Fractions, $\frac{1}{x^2-1}$

(ii) Write into Partial fractions without finding the constants $\frac{9}{(x+2)^2(x-1)}$

(iii) Find the indicated term of the following sequence 1, -3, 5, -7, 9, -11, ... , a_8.

(iv) If the nth term of the A.P is 3n-1, find arithmetic progression.

(v) Find the 12th term of the geometric sequence $1+i, 2i, -2+2i$, -------

(vi) If the numbers $\frac{1}{k}, \frac{1}{2k+1}$ *and* $\frac{1}{4k-1}$ are in harmonic sequence, find k.

(vii) Evaluate ${}^{16}P_4$. **(viii)** In how many ways can a necklace of 8 beads of different colours be made?

(ix) Find the value of n, when ${}^nC_5 = {}^nC_4$ **(x)** Calculate by means of binomial theorem $(0.97)^3$

(xi) Expand up to 3 terms $(1-x)^{1/2}$

(xii) If x is so small that its square and higher powers be neglected, then show that $\frac{\sqrt{4+x}}{(1-x)^3} \approx 2 + \frac{25}{4}x$

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

(i) Convert $54^{o}\,45'$ into radians

(ii) Verify $Sin^2\left(\frac{\pi}{6}\right)+Sin^2\left(\frac{\pi}{3}\right)+\tan^2\left(\frac{\pi}{4}\right)=2$

(iii) Prove that $\cos^4\theta-\sin^4\theta-\cos^2\theta-\sin^2\theta\ \forall\theta\in R.$

(iv) Without using tables write down the value of $\cos 315°$

(v) Prove that $\tan(45^{\circ}+A)\tan(45^{\circ}-A)=1$ **(vi)** Prove that $\frac{\sin A+\sin 2A}{1+\cos A+Cos\,2A}=\tan A$

(vii) Find the period of $3\cos\left(\frac{x}{5}\right)$ **(viii)** Find the value of Cot $89^{\circ}9'$

(ix) Find the area of ΔABC having a= 200 , b=120 , $\gamma=150^{o}$

(x) In ΔABC *if* $a=13, b=14, c=15$ *find* R

(xi) Show that $\sin^{-1}(-x)=-\sin^{-1}(x)$ **(xii)** Solve the equation $\sin x=\frac{1}{2}$

(xiii) Find the solutions of $\sin x=-\frac{\sqrt{3}}{2}$ *which lie in* $[0, 2\pi]$

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

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

5. (a) Use cramer's rule to solve the system of Equations $\begin{aligned}3x_1+x_2-x_3&=-4\\ x_1+x_2-2x_3&=-4\\ -x_1+2x_2-x_3&=1\end{aligned}$

(b) Use synthetic division to find the values of p and q if $x+1$ and $x-2$ are the factors of the polynomial x^3+px^2+qx+6

6. (a) Resolve into Partial fractions $\frac{9x-7}{(x^2+1)(x+3)}$

(b) If the (positive) Geometric Mean and Harmonic Mean between two numbers are 4 and $\frac{16}{5}$, *find the numbers.*

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

(b) Find 6th term in the expansion of $\left(x^2-\frac{3}{2x}\right)^{10}$

8. (a) If $\sin\theta=-\frac{1}{\sqrt{2}}$ and the terminal arm of angle is not in quad. III Find the values of remaining trigonometric functions.

(b) Prove that $\frac{2\sin\theta\sin 2\theta}{\cos\theta+\cos 3\theta}=\tan 2\theta\tan\theta$

9. (a) Prove that $r=4R\ Sin\frac{\alpha}{2}\ Sin\frac{\beta}{2}\ Sin\frac{\gamma}{2}$ **(b)** Prove that $2\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{7}=\frac{\pi}{4}$

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(Inter Part – I) (Session 2015-17 to 2018-20) Sig. of Student ----------

Mathematics (Objective) **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 multiplicative inverse of $1-2i$ is

(A) $\frac{1+2i}{5}$ (B) $\frac{-1+2i}{5}$ (C) $\frac{1-2i}{5}$ (D) $\frac{1+2i}{3}$

2) The number of identity elements in a group is

(A) Finite (B) 2 (C) 3 (D) 1

3) The matrix $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ is

(A) Null matrix (B) Identity matrix (C) Diagonal matrix (D) Scalar matrix

4) If $\begin{vmatrix} K & 4 \\ 4 & K \end{vmatrix} = 0$. Then value of K is

(A) ± 16 (B) 0 (C) ± 4 (D) ± 8

5) The product of roots of the equation $3x^2 + 4x = 0$ is

(A) $\frac{-4}{3}$ (B) $\frac{4}{3}$ (C) 0 (D) 4

6) When $P(x) = x^3 + 4x^2 - 2x + 5$ is divided by $(x-1)$, remainder is

(A) 10 (B) -10 (C) 8 (D) -8

7) If $(2x+1) = A(x+1) + B(x+2)$, then $A =$ _____

(A) 3 (B) 4 (C) 5 (D) 1

8) The harmonic mean between 3 and 7 is

(A) $\frac{5}{21}$ (B) $\frac{21}{5}$ (C) 5 (D) 21

9) If A , G , H have their usual meaning, $G^2 =$

(A) H (B) A (C) $A \times H$ (D) A/H

10) ${}^nP_n =$

(A) n (B) 0 (C) 1 (D) n!

11) If ${}^{n}C_{10} = {}^{n}C_{14}$ then n =

(A) 24 (B) 8 (C) 20 (D) 18

12) The number of terms in the expension of $(1+x)^{1/3}$ is

(A) 3 (B) 4 (C) Infinite (D) Finite

13) The sum of coefficients in the expension of $(1+x)^5$ is

(A) 8 (B) 16 (C) 32 (D) 64

14) $\cot^2\theta - \operatorname{cosec}^2\theta =$

(A) 2 (B) -1 (C) 1 (D) 0

15) $\tan\left(\frac{3\pi}{2} + \theta\right) =$

(A) $\cot\theta$ (B) $\tan\theta$ (C) $-\cot\theta$ (D) $-\tan\theta$

16) Domain of $y = \sin x$ is

(A) IR (B) $[-1, 1]$ (C) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ (D) Q

17) In any triangle ABC, with usual notation $b^2 + c^2 - 2bc\cos\alpha =$

(A) Δ (B) 0 (C) a^2 (D) 1

18) $\sqrt{\frac{s(s-a)}{bc}} =$

(A) $\sin\alpha/2$ (B) $\sin\beta/2$ (C) $\cos\alpha/2$ (D) $\cos\beta/2$

19) $\tan(\tan^{-1}(1)) =$

(A) 1 (B) $\frac{\pi}{4}$ (C) $\pi/3$ (D) 0

20) Solution of $\cot\theta = \frac{1}{\sqrt{3}}$ in IIIrd quadrant is

(A) $\frac{5\pi}{4}$ (B) $\frac{7\pi}{4}$ (C) $\frac{4\pi}{3}$ (D) π

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Mathematics (Subjective) (Session 2015-17 to 2018-20) Paper (I)

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

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

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

(i) Check the closure property w.r.t "x" on {-1,1}

(ii) Define modulus of a complex number.

(iii) Find multiplicative inverse of $-3-5i$

(iv) Write down power set of {a,{b,c}}

(v) Construct truth table for an implication.

(vi) Define Semigroup.

(vii) Find x & y if $\begin{bmatrix}2 & 0 & x\\ 1 & y & 3\end{bmatrix}+2\begin{bmatrix}1 & x & y\\ 0 & 2 & -1\end{bmatrix}=\begin{bmatrix}4 & -2 & 3\\ 1 & 6 & 1\end{bmatrix}$

(viii) Find A^{-1} if $A=\begin{bmatrix}2 & 1\\ 6 & 3\end{bmatrix}$

(ix) If A is a non-singular matrix, then show that $(A^{-1})^{-1}=A$

(x) Solve $2x^2+12x-110=0$

(xi) If ω is cube root of unity and $\omega^3=1$, then evaluate $\omega^{28}+\omega^{29}+1$

(xii) Discuss the nature of roots of $25x^2-30x+9=0$

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

(i) Define Improper rational fraction and give one example.

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

(iii) Convert an improper fraction $\frac{2x^3+x^2-x-3}{x(2x+3)(x-1)}$ into mixed form.

(iv) Sum the series $1.11+1.41+1.71+\ldots\ldots+a_{10}$

(v) Define a geometric sequence and give an example.

(vi) Insert one real geometric mean between $-2i$ and $8i$

(vii) Find the sum of infinite geometric series $4+2\sqrt{2}+2+\sqrt{2}+1+\ldots\ldots$

(viii) If $\frac{1}{k}, \frac{1}{2k+1}, \frac{1}{4k-1}$ are in harmonic sequence, find k

(ix) In how many ways the necklaces from 6 beads of different colours can be made.

(x) If $1+2+4+\ldots\ldots+2^{n-1}=2^n-1$ then check the statement for n = 2 and n = 3 is either true or false.

(xi) Evaluate $(9.9)^3$ using binomial theorem upto two decimal places.

(xii) Expand $(1+x)^{-1/3}$ upto 4 terms.

Sargodha Board-2019

4. Answer briefly any Nine parts from the followings:- $9 \times 2 = 18$

(i) Define "right angled triangle".

(ii) What is the length of the arc intercepted on a circle of radius 14 cms by the arms of a central angle of 45° ?

(iii) Find the values of $\sin\theta$ and $\cos\theta$ when $\tan\theta = -\frac{1}{3}$ and the terminal arm of the angle is in quad ii.

(iv) Prove that: $\cos 306^\circ + \cos 234^\circ + \cos 162^\circ + \cos 18^\circ = 0$ without using calculator

(v) Prove that : $\sin(45^\circ + \alpha) = \frac{1}{\sqrt{2}}(\sin\alpha + \cos\alpha)$ (vi) Prove the identity $\frac{\sin\alpha - \sin\beta}{\sin\alpha + \sin\beta} = \tan\frac{\alpha-\beta}{2}\tan\frac{\alpha-\beta}{2}$

(vii) Find the period of $\cos\frac{x}{6}$ (viii) State 'The Law of Sines'.

(ix) Find the area of the triangle ABC when its sides are $a = 18$, $b = 24$, $c = 30$

(x) Show that $\sin^{-1}(-x) = -\sin^{-1}x$ (xi) Find the solutions of the equation $\cot\theta = \frac{1}{\sqrt{3}}$, θ lies in $[0 , 2\pi]$

(xii) Solve the equation $\sec^2\theta = \frac{4}{3}$, $\theta \in [0 , 2\pi]$

(xiii) When the angle between the ground and the sun is 30°, flag pole casts a shadow of 40 m long. Find the height of the top of the flag.

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

Note: Attempt any three questions. $(10 \times 3 = 30)$

5. (a) Show that the set $\{1 , \omega , \omega^2\}$, When $\omega^3 = 1$, is an abelian group w.r.t. ordinary multiplication.

(b) If $3n^2 + 2n + 1$ be nth term of the series, find the sum to 2n terms.

6. (a) Show that $\begin{vmatrix} x & 1 & 1 & 1 \\ 1 & x & 1 & 1 \\ 1 & 1 & x & 1 \\ 1 & 1 & 1 & x \end{vmatrix} = (x+3)(x-1)^3$

(b) Find values of n and r when ${}^{n-1}C_{r-1} : {}^nC_r : {}^{n+1}C_{r+1} = 3:6:11$

7. (a) Solve the equation $\left(x - \frac{1}{x}\right)^2 + 3\left(x + \frac{1}{x}\right) = 0$

(b) Find the coefficient of x^5 in the expenssion of $\left(x^2 - \frac{3}{2x}\right)^{10}$

8. (a) Prove the identity $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta} = 2\sec^2\theta$

(b) If α, β, γ are the angles of the triangle ABC, show that

$$\cot\tfrac{\alpha}{2} + \cot\tfrac{\beta}{2} + \cot\tfrac{\gamma}{2} = \cot\tfrac{\alpha}{2}\cot\tfrac{\beta}{2}\cot\tfrac{\gamma}{2}$$

9 (a) Prove that $r = \frac{\Delta}{s}$ with usual notation (b) Show that $\tan(\sin^{-1}x) = \frac{x}{\sqrt{1-x^2}}$

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(Inter Part – I) (Session 2014-16 to 2017-19) Sig: of Student ----------
Mathematics (Objective) **Paper (I)**
Time Allowed:- 30 minutes **PAPER CODE 2197** 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) A quadratic equation has degree.

(A) 0 (B) 1 (C) 2 (D) 3

2) The roots of the equation $x^2+x-6=0$ are

(A) Real (B) Equal (C) Complex (D) Irrational

3) The given form $(x-4)^2=x^2-8x+16$ is

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

4) The third term of the sequence $a_n=(-1)^n(n-7)$ is

(A) 8 (B) 4 (C) -8 (D) -4

5) Let A , G , H be arithmetic, geometric and harmonic means between "a" & "b" respectively then $G^2=$

(A) A + H (B) $\sqrt{ab}$ (C) A/H (D) A H

6) $9\times8\times7$ is equal to

(A) 9! (B) $9!/7!$ (C) $3!/2!$ (D) $9!/6!$

7) The number π is

(A) Whole number (B) A natural number (C) A rational number (D) An irrational number

8) If every element of a set A is also an element of set B, then

(A) $A \subseteq B$ (B) $B \subseteq A$ (C) $A \cap B = \phi$ (D) $A \cap B = B$

9) If the matrices $A=\begin{bmatrix}1&2&3\\4&5&6\end{bmatrix}$ then A^t, the transpose of A is

(A) $\begin{bmatrix}1&4\\2&5\\3&6\end{bmatrix}$ (B) $\begin{bmatrix}1&2\\3&4\\5&6\end{bmatrix}$ (C) $\begin{bmatrix}1&3\\2&4\\5&6\end{bmatrix}$ (D) $\begin{bmatrix}1&2\\3&5\\4&6\end{bmatrix}$

10) If the determinant $\begin{vmatrix}k&4\\4&k\end{vmatrix}=0$ then k is equal to

(A) 16 (B) 0 (C) ±4 (D) 8

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Mathematics (Subjective) (Session 2014-16 to 2017-19) Paper (I)

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

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

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

(i) Define Recurring or Periodic decimal, Give one example. **(ii)** Factorize: $a^2 + 4b^2$

(iii) Find multiplicative inverse of "$-3-5i$".

(iv) Write $\{ x | x \in Z \wedge -5 < x < 5 \}$ in the descriptive and tabular form.

(v) Write inverse and contrapositive of $\sim p \rightarrow q$ **(vi)** Define (1 – 1) and onto function.

(vii) Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$

(viii) If $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$, find cofactors A_{12} and A_{22} **(ix)** Without expansion verify that : $\begin{vmatrix} bc & ca & ab \\ \frac{1}{a} & \frac{1}{b} & \frac{1}{c} \\ a & b & c \end{vmatrix} = 0$

(x) State two basic techniques for solving a quadratic equation.

(xi) Solve the equation: $2x^4 - 32 = 0$ **(xii)** Discuss the nature of the roots of $2x^2 - 7x + 3 = 0$

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

(i) Write the partial fraction form of $\frac{2x^4 - 3x^2 - 4x}{(x^2+2)^2 (x+1)^2}$.

(ii) Write the first four terms of the sequence if $a_n - a_{n-1} = n+2$, $a_1 = 2$

(iii) Sum the series upto 10^{th} term $1.11 + 1.41 + 1.71 + ----$

(iv) If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in G.P show that the common ratio is $\pm\sqrt{\frac{a}{c}}$

(v) Find Vulgar fraction equivalent to the recurring decimal. $1.3\dot{4}$

(vi) Find A , G , H and show that $G^2 = A.H$ if a = -2 , b = -6 (with usual notation)

(vii) Find the value of n when ${}^nP_2 = 30$ with usual notation.

(viii) Find the value of n when ${}^nC_{12} = {}^nC_6$ with usual notation.

(ix) A box contains 10 red , 30 white and 20 black marbles. A marble is drawn at random. Find the probability that it is either red or white.

(x) Show that the formula is true for $n = 1, 2$.

$$1^3 + 3^3 + 5^3 + ----+(2n-1)^3 = n^2[2n^2 - 1]$$

(xi) Using Binomial theorem expand $(9.9)^5$

(xii) Expand upto 4 terms, taking the value of x such that the expansion is valid $(4-3x)^{1/2}$