SGD-11-1-23

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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

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**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 $\Delta ABC$ 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) $\Delta$ (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 × 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 {+, −, ×, ÷}

**(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 $\alpha, \beta$ 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 × 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.

**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 $45^\circ$

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

**(v)** Prove that $\frac{\cos 8^\circ - sin\,8^\circ}{cos\,8^\circ + sin\,8^\circ} = tan\,37^\circ$ **(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 $\theta$ 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 $\alpha + \beta + \gamma = 180^\circ$, *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 $\sin^{-1}\left(\frac{5}{13}\right) + \sin^{-1}\left(\frac{7}{25}\right) = \cos^{-1}\left(\frac{253}{325}\right)$

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**( 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

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**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) $2\pi$ (C) $4\pi$ (D) $\pi$

**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) $\sqrt{1+x^2}$

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**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 $\alpha, \beta$ 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.

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**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 $\beta$.

**(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** **(10 × 3 = 30)**

**Note: Attempt any three questions.**

**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 $\alpha, \beta$ *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 $\theta$ 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; $2tan^{-1}\frac{1}{3} + tan^{-1}\frac{1}{7} = \frac{\pi}{4}$