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 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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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 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 α, β are roots of $3x^2$ -2x+4=0 Find value of α^2-β^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°

(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 $\frac{\cos 8^\circ - sin\,8^\circ}{cos\,8^\circ + sin\,8^\circ} = tan\,37^\circ$ **(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 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 $\begin{aligned} 12x^2 - 11xy + 2y^2 &= 0 \\ 2x^2 + 7xy &= 60 \end{aligned}$

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

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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 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.

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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 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 **(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 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; $2tan^{-1}\frac{1}{3} + tan^{-1}\frac{1}{7} = \frac{\pi}{4}$

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(Inter Part – I) (Session 2018-20 to 2021-23) 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) Imaginary part of $\frac{i}{1+i}$ is

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

2) Under what conditions on A and B, the statement $A \cap B = A$ is true

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

3) If order of A^t is $m \times n$, then order of matrix A is

(A) n×n (B) n×m (C) m×n (D) m×m

4) A square matrix A is skew hermitian if

(A) $(\overline{A})' = -A$ (B) $(\overline{A})' = A$ (C) $A^t = A$ (D) $A^t = -A$

5) Which of the following equation has the roots 2 and –3

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

6) If the sum of the roots of the equation $ax^2 - 2x + 2a = 0$ is equal to their product, then the value of a is

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

7) Partial fractions of $\frac{2x+3}{x^2(x^2-1)}$ will be of the form

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

8) A.M between $\frac{a}{2}$ and $\frac{2}{a}$ is

(A) $\frac{a^2+4}{a}$ (B) $\frac{a^2+4}{2}$ (C) $\frac{a^2+4}{2a}$ (D) $\frac{a^2+4}{4a}$

9) The sum of first "n" natural number is

(A) $\frac{(n+1)(n+2)}{2}$ (B) $\frac{n(n+1)}{2}$ (C) $\frac{n(n+1)(2n+1)}{6}$ (D) $\left(\frac{n(n+1)}{2}\right)^2$

10) r! ${}^{n}C_{r}$ =

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

11) If A and B are independent events, then $P(A \cap B)$ =

(A) $P(A)+P(B)$ (B) $P(A)-P(B)$ (C) $P(A)\cdot P(B)$ (D) $P(A)+P(B)-P(A\cap B)$

12) Sum of binomial coefficients in the expansion of $(a+x)^5$ is

(A) 5 (B) 10 (C) 16 (D) 32

13) The expansion $(2-3x)^{-2}$ is valid if

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

14) Angle between the hands of a watch at 6 O'clock is

(A) 30^o (B) 60^o (C) 90^o (D) 180^o

15) $\tan(\theta-270^o)$ =

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

16) Period of $\cos\theta$ is

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

17) Formula for circum-radius is

(A) $\frac{\Delta}{s}$ (B) $\frac{s}{\Delta}$ (C) $\frac{4\Delta}{abc}$ (D) $\frac{abc}{4\Delta}$

18) Area of a triangle ABC =

(A) $\frac{1}{2}bc\sin\gamma$ (B) $\frac{1}{2}ab\sin\gamma$ (C) $\frac{1}{2}ac\sin\gamma$ (D) $\frac{1}{2}ab\sin\beta$

19) $\tan^{-1}x+\cot^{-1}x$ =

(A) 0 (B) 1 (C) $\frac{\pi}{2}$ (D) π

20) Reference angle for $2\sin x-1=0$ is

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

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Mathematics (Subjective) (Session 2018-20 to 2021-23) 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 in the $\{0, 1\}$ w.r.t addition and multiplication.

(ii) Find the multiplicative Inverse of (-4 , 7) **(iii)** Separate into real and imaginary parts. $\frac{2-7i}{1+i}$

(iv) Write down the power set of $\{a,\{b,c\}\}$ **(v)** Define Semi – group.

(vi) Write converse and Inverse of $q \to p$

(vii) Without expansion verify that $\begin{vmatrix} 1 & 2 & 3x \\ 2 & 3 & 6x \\ 3 & 5 & 9x \end{vmatrix} = 0$ **(viii)** Find A^{-1} if $A = \begin{bmatrix} 5 & 3 \\ 1 & 1 \end{bmatrix}$

(ix) Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$ **(x)** Solve the equation $x^{1/2} - x^{1/4} - 6 = 0$

(xi) Define Reciprocal equation.

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

(i) Resolve into partial fraction $\frac{2x+1}{(x-1)(x+2)(x+3)}$

(iii) Find the next two terms of the sequence 1, -3, 5, -7, 9, -11, …

(iv) Find the A.M (Arithmetic Mean) between $x-3$ and $x+5$

(v) Find the 11^{th} Term of the sequence $1+i$, 2, $\frac{4}{1+i}$,.....

(vii) Find vulgar fraction equivalent to the recurring decimals $0.\dot{7}$

(viii) How many diagonals can be formed by joining the vertices of the 8-sided polygon.

(ix) Write into factorial form (n + 2) (n + 1) (n). **(x)** Show that $n^3 - n$ is divisible by 6 for n = 2 , 3

(xi) Find the general term of $\left(\frac{a}{2} - \frac{2}{a}\right)^6$ **(xii)** Evaluate $\sqrt[3]{30}$ correct to three decimal places.

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

(i) Define Degree and Radian measure of an angle.

(ii) An arc subtends an angle of 70° at the centre of a circle and its length is 132 mm. Find the radius of circle.

(iii) Prove that $\sqrt{\dfrac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$ **(iv)** Prove that $\dfrac{\sin(\alpha+\beta)+\sin(\alpha-\beta)}{\cos(\alpha+\beta)+\cos(\alpha-\beta)} = \tan\alpha$

(v) Express $\sin 12^\circ \sin 46^\circ$ as sum or difference. **(vi)** Prove that $\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$

(vii) Find the period of $\operatorname{cosec}\dfrac{x}{4}$ **(viii)** Find the area of triangle if $a = 4.33$ $b = 9.25$ $\gamma = 56^\circ 44'$

(ix) Show that $r_3 = s\tan\dfrac{\gamma}{2}$

(x) 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.

(xi) Find the value of $\sec\left[\sin^{-1}\left(-\dfrac{1}{2}\right)\right]$

(xii) Solve $\sin x + \cos x = 0$

(xiii) Find the solution of equation $\sec x = -2$ in $[0, 2\pi]$

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

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

5. (a) Use matrices to solve the system
$$\begin{aligned} x - 2y + z &= -1 \\ 3x + y - 2z &= 4 \\ y - z &= 1 \end{aligned}$$

(b) Solve the equation $\sqrt{3x^2-7x-30} - \sqrt{2x^2-7x-5} = x-5$

6. (a) Resolve $\dfrac{4x^3}{(x^2-1)(x+1)^2}$ into partial fraction

(b) The sum of an infinite geometric series is 9 and the sum of the square of its term is $\dfrac{81}{5}$: Find the series.

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

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

8. (a) Find the values of remaining trigonometric functions if $\operatorname{cosec}\theta = \dfrac{m^2+1}{2m}$; $m > 0$ and $0 < \theta < \pi/2$

(b) Reduce $\cos^4\theta$ to an expression involving only functions of multiple of θ, raised to first power.

9 (a) Prove that $\Delta = 4Rr\cos\alpha/2\cos\beta/2\cos\gamma/2$

(b) Show that $\tan(\sin^{-1}x) = \dfrac{x}{\sqrt{1-x^2}}$

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(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. 540-41-21 **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) $\pi/6$

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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:- SGD-41-21 **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:- 540-6121 **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 $\tan 19^\circ 30'$

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

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(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.

SGD-G2-21

Q. 1

1) Partial fraction of $\frac{1}{(x+1)(x^2}$ will be of the form

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(A) $\frac{A}{x+1}+\frac{Bx+c}{x^2-1}$ (B) $\frac{A}{x+1}+\frac{B}{(x+1)}$ (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, $\frac{b-c}{b+c}=$ S40-G2-21

(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**

540-42-21

(i) Find the multiplicative inverse of (-4 , 7) **(ii)** Show that $\forall z_1, z_2 \in C$, $\overline{z_1 + z_2} = \overline{z}_1 + \overline{z}_2$

(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 $1+i, 2i, -2+2i, \ldots\ldots$

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