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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 $P\rightarrow(p\vee q)$ 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:- SGD-G&21 **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 $54^{\circ}\,45'$ 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

$$3x_1+x_2-x_3=-4$$
$$x_1+x_2-2x_3=-4$$
$$-x_1+2x_2-x_3=1$$

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