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. 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) $2\sin 45^\circ + \frac{1}{2}\operatorname{cosec} 45^\circ =$

(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 $\alpha = 30^\circ$, then value of $\cot 3\alpha =$

(A) 0 (B) 1 (C) 3 (D) ∞

17) The period of $\operatorname{cosec} 10x$ 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) $\alpha = 90^\circ$ (B) $\beta = 90^\circ$ (C) $\gamma = 90^\circ$ (D) No angle is 90°

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 5th 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 $\tan 19°30'$

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