

SGD-11-1-23

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 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 $f: A \rightarrow B$ is surjective if:

- (A) Range $f = A$ (B) Range of $f = B$ (C) Range $f \neq A$ (D) Range $f \neq B$

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) nC_0 equals:

- (A) nP_2 (B) nC_n (C) nC_2 (D) ${}^nC_{n+1}$

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° (B) 57° (C) 56° (D) 0.0175°

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

- (A) 30° (B) 0° (C) 45° (D) 60°

17) Range of cotangent function is:

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

18) If $\triangle ABC$ 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) 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

8 × 2 = 16

2. Answer briefly any Eight parts from the followings:-

- (i) Show that $\forall z_1, z_2 \in \mathbb{C}, \overline{z_1 z_2} = \overline{z_1} \overline{z_2}$.
- (ii) Simplify by justifying each step $\frac{\frac{a}{b} + \frac{c}{d}}{\frac{a}{b} - \frac{c}{d}}$ (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 $AA^t = A$ (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 × 2 = 16

- (i) Without finding unknown constants, write partial fraction form of $\frac{3x^2 - 4x - 5}{(x - 2)(x^2 + 7x + 10)}$
- (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 $-9 - 6 - 3 + 0 + \dots$ 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 $y = 1 + \frac{x}{2} + \frac{x^2}{4} + \dots$, 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.

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4. Answer briefly any Nine parts from the followings:-

$$9 \times 2 = 18$$

- (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 $2\sin^2 \theta - \sin \theta = 0$ in $[0, 2\pi]$.

Section ----- II

Note: Attempt any three questions.

$$(10 \times 3 = 30)$$

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 $\begin{cases} 12x^2 - 11xy + 2y^2 = 0 \\ 2x^2 + 7xy = 60 \end{cases}$

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 $2 + (1-i) + \left(\frac{1}{i}\right) + \dots$ 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 $\cot \alpha \cdot \cot \beta + \cot \beta \cdot \cot \gamma + \cot \gamma \cdot \cot \alpha = 1$

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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