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1119 Warning:- Please write your Roll No. in the space provided and sign. Roll No----------
(Inter Part – I) (Session 2015-17 to 2018-20) 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) The multiplicative inverse of $1-2i$ is

(A) $\frac{1+2i}{5}$ (B) $\frac{-1+2i}{5}$ (C) $\frac{1-2i}{5}$ (D) $\frac{1+2i}{3}$

2) The number of identity elements in a group is

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

3) The matrix $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ is

(A) Null matrix (B) Identity matrix (C) Diagonal matrix (D) Scalar matrix

4) If $\begin{vmatrix} K & 4 \\ 4 & K \end{vmatrix} = 0$. Then value of K is

(A) ± 16 (B) 0 (C) ± 4 (D) ± 8

5) The product of roots of the equation $3x^2 + 4x = 0$ is

(A) $\frac{-4}{3}$ (B) $\frac{4}{3}$ (C) 0 (D) 4

6) When $P(x) = x^3 + 4x^2 - 2x + 5$ is divided by $(x-1)$, remainder is

(A) 10 (B) -10 (C) 8 (D) -8

7) If $(2x+1) = A(x+1) + B(x+2)$, then $A =$ _____

(A) 3 (B) 4 (C) 5 (D) 1

8) The harmonic mean between 3 and 7 is

(A) $\frac{5}{21}$ (B) $\frac{21}{5}$ (C) 5 (D) 21

9) If A , G , H have their usual meaning, $G^2 =$

(A) H (B) A (C) $A \times H$ (D) A/H

10) ${}^nP_n =$

(A) n (B) 0 (C) 1 (D) n!

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11) If ${}^{n}C_{10} = {}^{n}C_{14}$ then n =

(A) 24 (B) 8 (C) 20 (D) 18

12) The number of terms in the expension of $(1+x)^{1/3}$ is

(A) 3 (B) 4 (C) Infinite (D) Finite

13) The sum of coefficients in the expension of $(1+x)^5$ is

(A) 8 (B) 16 (C) 32 (D) 64

14) $\cot^2\theta - \operatorname{cosec}^2\theta =$

(A) 2 (B) -1 (C) 1 (D) 0

15) $\tan\left(\frac{3\pi}{2}+\theta\right) =$

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

16) Domain of y = sinx is

(A) IR (B) [-1 , 1] (C) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ (D) Q

17) In any triangle ABC, with usual notation $b^2 + c^2 - 2bc\cos\alpha =$

(A) Δ (B) 0 (C) a^2 (D) 1

18) $\sqrt{\frac{s(s-a)}{bc}} =$

(A) $\sin\alpha/2$ (B) $\sin\beta/2$ (C) $\cos\alpha/2$ (D) $\cos\beta/2$

19) $\tan(\tan^{-1}(1)) =$

(A) 1 (B) $\frac{\pi}{4}$ (C) $\pi/3$ (D) 0

20) Solution of $\cot\theta = \frac{1}{\sqrt{3}}$ in IIIrd quadrant is

(A) $\frac{5\pi}{4}$ (B) $\frac{7\pi}{4}$ (C) $\frac{4\pi}{3}$ (D) π

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Mathematics (Subjective) (Session 2015-17 to 2018-20) 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 w.r.t "x" on {-1,1}

(ii) Define modulus of a complex number.

(iii) Find multiplicative inverse of $-3-5i$

(iv) Write down power set of {a,{b,c}}

(v) Construct truth table for an implication.

(vi) Define Semigroup.

(vii) Find x & y if $\begin{bmatrix}2 & 0 & x\\ 1 & y & 3\end{bmatrix}+2\begin{bmatrix}1 & x & y\\ 0 & 2 & -1\end{bmatrix}=\begin{bmatrix}4 & -2 & 3\\ 1 & 6 & 1\end{bmatrix}$

(viii) Find A^{-1} if $A=\begin{bmatrix}2 & 1\\ 6 & 3\end{bmatrix}$

(ix) If A is a non-singular matrix, then show that $(A^{-1})^{-1}=A$

(x) Solve $2x^2+12x-110=0$

(xi) If ω is cube root of unity and $\omega^3=1$, then evaluate $\omega^{28}+\omega^{29}+1$

(xii) Discuss the nature of roots of $25x^2-30x+9=0$

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

(i) Define Improper rational fraction and give one example.

(ii) Resolve $\frac{1}{x^2-1}$ into partial fractions.

(iii) Convert an improper fraction $\frac{2x^3+x^2-x-3}{x(2x+3)(x-1)}$ into mixed form.

(iv) Sum the series $1.11+1.41+1.71+\ldots\ldots+a_{10}$

(v) Define a geometric sequence and give an example.

(vi) Insert one real geometric mean between $-2i$ and $8i$

(vii) Find the sum of infinite geometric series $4+2\sqrt{2}+2+\sqrt{2}+1+\ldots\ldots$

(viii) If $\frac{1}{k}, \frac{1}{2k+1}, \frac{1}{4k-1}$ are in harmonic sequence, find k

(ix) In how many ways the necklaces from 6 beads of different colours can be made.

(x) If $1+2+4+\ldots\ldots+2^{n-1}=2^n-1$ then check the statement for n = 2 and n = 3 is either true or false.

(xi) Evaluate $(9.9)^5$ using binomial theorem upto two decimal places.

(xii) Expand $(1+x)^{-1/3}$ upto 4 terms.

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

(i) Define "right angled triangle".

(ii) What is the length of the arc intercepted on a circle of radius 14 cms by the arms of a central angle of 45° ?

(iii) Find the values of $\sin\theta$ and $\cos\theta$ when $\tan\theta = -\frac{1}{3}$ and the terminal arm of the angle is in quad ii.

(iv) Prove that: $\cos 306^\circ + \cos 234^\circ + \cos 162^\circ + \cos 18^\circ = 0$ without using calculator

(v) Prove that : $\sin(45^\circ + \alpha) = \frac{1}{\sqrt{2}}(\sin\alpha + \cos\alpha)$ (vi) Prove the identity $\frac{\sin\alpha - \sin\beta}{\sin\alpha + \sin\beta} = \tan\frac{\alpha-\beta}{2}\tan\frac{\alpha+\beta}{2}$

(vii) Find the period of $\cos\frac{x}{6}$ (viii) State 'The Law of Sines'.

(ix) Find the area of the triangle ABC when its sides are $a = 18$, $b = 24$, $c = 30$

(x) Show that $\sin^{-1}(-x) = -\sin^{-1}x$ (xi) Find the solutions of the equation $\cot\theta = \frac{1}{\sqrt{3}}$, θ lies in $[0 , 2\pi]$

(xii) Solve the equation $\sec^2\theta = \frac{4}{3}$, $\theta \in [0 , 2\pi]$

(xiii) When the angle between the ground and the sun is 30°, flag pole casts a shadow of 40 m long. Find the height of the top of the flag.

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

Note: Attempt any three questions. $(10 \times 3 = 30)$

5. (a) Show that the set $\{1 , \omega , \omega^2\}$, When $\omega^3 = 1$, is an abelian group w.r.t. ordinary multiplication.

(b) If $3n^2 + 2n + 1$ be nth term of the series, find the sum to 2n terms.

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

7. (a) Solve the equation $\left(x - \frac{1}{x}\right)^2 + 3\left(x + \frac{1}{x}\right) = 0$

(b) Find the coefficient of x^5 in the expenssion of $\left(x^2 - \frac{3}{2x}\right)^{10}$

8. (a) Prove the identity $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta} = 2\sec^2\theta$

(b) If α, β, γ are the angles of the triangle ABC, show that

$$\cot\tfrac{\alpha}{2} + \cot\tfrac{\beta}{2} + \cot\tfrac{\gamma}{2} = \cot\tfrac{\alpha}{2}\cot\tfrac{\beta}{2}\cot\tfrac{\gamma}{2}$$

9 (a) Prove that $r = \frac{\Delta}{s}$ with usual notation (b) Show that $\tan(\sin^{-1}x) = \frac{x}{\sqrt{1-x^2}}$