11161
MATHEMATICS (New Book)
PART-I

NOTE: There are three sections of this paper. Carefully read the instructions for each section and attempt accordingly. Attempt all questions of Section-A and return it to the Superintendent within given time, even if you have not attempted any question. Select the correct choice and write only A, B, C or D, whichever is appropriate, in the answer box. No marks will be awarded for cutting/erasing or overwriting.

SECTION-A

Time: 20 Minutes **Marks:** 20

1. $(-i)^{-98} =$ ..... A) $\frac{1}{i}$, B) $\frac{-1}{i}$, C) 1, D) -1 ..... [D]

2. If z be a complex number, then $z\bar{z} =$ ..... A) $|z|^2$, B) $|z|$, C) $(z)^2$, D) none of these ..... [ ]

3. If in a square matrix A, $|A| \neq 0$, then the matrix is called a ..... matrix. A) singular, B) non-singular, C) scalar, D) diagonal ..... [B]

4. When two rows or two columns of a square matrix "A" are identical, then $|A| =$ ..... A) non-singular, B) one, C) zero, D) any number ..... [C]

5. If $\vec{a} = \alpha\vec{b}$, where α is a scalar quantity, then $\vec{a}$ and $\vec{b}$ are ..... A) parallel, B) perpendicular, C) collinear, D) non-collinear ..... [A]

6. If $\vec{a}.\vec{b} = 0$ and neither $\vec{a}$ nor $\vec{b}$ are zero, then $\theta =$ ..... A) 0, B) $\frac{\pi}{4}$, C) $\frac{\pi}{3}$, D) $\frac{\pi}{2}$ ..... [C]

7. The nth term of the geometric sequence is ..... A) ar^{n-1}, B) $a+(n-1)d$, C) $\frac{a+b}{2}$, D) $\pm\sqrt{ab}$ ..... [A]

8. $S_\infty = \frac{a_1}{1-r}$, if ..... A) $|r|=1$, B) $|r|<1$, C) $|r|>1$, D) $|r|=2$ ..... [B]

9. The nth term of a series $1.2^2 + 2.3^2 + 3.4^2 + ...$ is $T_n =$ ..... A) $n(n-1)^2$, B) $n(n+1)$, C) $n(n-1)$, D) $n(n+1)^2$ ..... [ ]

10. ${}^nP_n =$ ..... A) 1, B) n, C) $(n)^n$, D) n! ..... [D]

11. ${}^{n-1}C_r + {}^{n-1}C_{r-1} =$ ..... A) ${}^nC_r$, B) ${}^{2n}C_{2r-1}$, C) ${}^nC_{2r-1}$, D) none of these ..... [ ]

12. If two events can not both occur at the same time, they are called ..... events. A) exchastive, B) equally likely, C) mutually exclusive, D) compound ..... [C]

13. When two events A and B are independent, then $P(A/B) =$ ..... A) $\frac{P(A \cap B)}{P(B)}$, B) $\frac{P(A \cap B)}{P(B)}$, C) P(A), D) P(B) ..... [C]

14. The general term of the binomial theorem $(a+b)^n$ is $T_{r+1} =$ ..... A) $\binom{n}{r}a^{n-r}b^r$, B) $\binom{n}{r}a^rb^{n+r}$, C) $\binom{n}{r}a^nb^r$, D) $\binom{n}{r}a^{n+r}b^r$ ..... [A]

15. If a function is one-to-one and onto, then it is called ..... A) injective, B) surjective, C) bijective, D) none of these ..... [ ]

16. If $f(-x) = -f(x)$, then the function f is called ..... function. A) even, B) rational, C) identity, D) odd .. [ ]

17. $1-2\sin^2\theta =$ ..... A) $\cos2\theta$, B) $\sin2\theta$, C) $\tan2\theta$, D) $\cot2\theta$ ..... [ ]

18. $\sin(2\pi-\theta)$ ..... A) $\sin\theta$, B) $-\sin\theta$, C) $\cos\theta$, D) $-\cos\theta$ ..... [ ]

19. $(\sin\theta-\cos\theta)^2 =$ ..... A) $1-\cos2\theta$, B) $1+\cos2\theta$, C) $1-\sin2\theta$, D) $1+\sin2\theta$ ..... [ ]

20. Range of cosx is ..... A) $0 \leq \cos x \leq 1$, B) $-1 \leq \cos x \leq 0$, C) $-1 \leq \cos x \leq 2$, D) $-1 \leq \cos x \leq 1$ ..... [ ]

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Time: 2 Hours 40 Minutes

SECTION-B

Marks: 50

1. Attempt any ten of the following. All carry equal marks.

i. If $z_1=1+2i$, $z_2=-2+3i$ and $z_3=-3-5i$, then show that $z_1+(z_2+z_3)=(z_1+z_2)+z_3$

ii. Separate the real and imaginary parts of $\left(\frac{\sqrt{3}-i}{\sqrt{3}+i}\right)^2$

iii. Solve the system of linear equations $x-y=3$ and $x+y=5$

iv. Let $A=\begin{bmatrix}2 & 3\\ -1 & 1\end{bmatrix}$, verify that $(A^{-1})^t=(A^t)^{-1}$

v. Find the unit vector in the direction of $\overrightarrow{AB}$ for the points A(−3, 5) and B(7, 9)

vi. Find the cosine of the angle between $\angle ABC$ when $\overrightarrow{AB}=i+2j+3k$ and $\overrightarrow{BC}=-4i+4j$

vii. Insert the five arithmetic mean between 5 and 8.

viii. Convert $2.3\overline{4}$ to a common fraction.

ix. Prove that $\frac{(n+5)!}{(n+3)!}=n^2+9n+20$

x. If $P(A)=\frac{1}{3}$, $P(A\cup B)=\frac{1}{2}$, $P(A\cap B)=\frac{1}{4}$ find $P(B)$

xi. Show that $(a-b)$ is a factor of (a^n-b^n) for all positive integer n.

xii. Expand $\sqrt{\frac{1-x}{1+x}}$ upto x^3

xiii. Given that $f(x)=2x^3+ax^2+4x-5$, so if $f(2)=3$, then find the value of "a".

SECTION-C

Marks: 30

NOTE: Attempt any three of the following questions. All questions carry equal marks.

2. i. Show that $\begin{vmatrix}1 & \alpha & \alpha^2\\ 1 & \beta & \beta^2\\ 1 & \gamma & \gamma^2\end{vmatrix}=(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

ii. For what value of n, $\left(\frac{a^{n+1}+b^{n+1}}{a^n+b^n}\right)$ is the arithmetic mean between "a" and "b" where "a" and "b" are not zero simultaneously.

3. i. Prove that $\frac{\sin\theta}{\sec 4\theta}+\frac{\cos\theta}{\operatorname{cosec} 4\theta}=\sin 5\theta$

ii. Show that $\frac{\sin\alpha-\sin\beta}{\cos\alpha+\cos\beta}=\tan\frac{\alpha-\beta}{2}$

4. i. Find the missing part of the triangle ABC, where a=209, b=120 and c=241

ii. Find the angle of the largest measure when a=7, b=9 and c=7

5. i. Find the domain and range of 5 sin 5 x.

ii. Draw the graph of the function $y=\sin(-x)$ $\quad 0\le x\le 2\pi$