Total No. of Questions-24

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Regd. No.


## Part III <br> MATHEMATICS <br> Paper II(A) <br> (English Version)

Time: 3 Hours
Max. Marks : 75
Note :-This question paper consists of THREE sections $A, B$ and $C$. SECTION A
$10 \times 2=20$
I. Very Short Answer Type Questions
(i) Answer ALL questions.
(ii) Each question carries TWO marks.

1. Find the multiplicative inverse of :

$$
7+24 i
$$

2. Simplify $i^{2}+i^{4}+i^{6}+\ldots \ldots \ldots$ up to $(2 n+1)$ terms.
3. If $x=$ cis 0 , then find the value of $x^{6}+\frac{1}{x^{6}}$.
4. Form the quadratic equation whose roots are :

$$
\frac{p-q}{p+q} \text { and } \quad-(p+q) \quad(p \neq \pm q)
$$

5. Find the algebraic equation whose roots are 2 times the roots of $x^{5}-2 x^{4}+3 x^{3}-2 x^{2}+4 x+3=0$.
6. Find the number of functions from a set $A$ containing 5 elements into a set B containing 4 elements.
7. If ${ }^{15} \mathrm{C}_{2_{r-1}}={ }^{15} \mathrm{C}_{2 r, 4}$, find $r$.
8. If ${ }^{22} \mathrm{C}_{\mathrm{r}}$ is the largest binomial coefficient in the expansion of $(1+x)^{2!}$. find the value of ${ }^{13} \mathrm{C}_{r}$.
9. Find the mean deviation from the mean of the following discrete data

$$
6,7,10,12,13,4,12,16 .
$$

10 BYJU'S

For a binomial distribution with mean 6 and variance 2, find the first two terms of the distribution.

## SECTION B

II. Short Answer Type Questions :
(i) Answer ANY FIVE questions.
(ii) Each question carries FOUR marks.
11. If the real part of $\left(\frac{z+1}{z+i}\right)$ is 1 , then find the locus of $z$ where $z=x+i y$.
12. Prove that :

$$
\frac{1}{3 x+1}+\frac{1}{x+1}-\frac{1}{(3 x+1)(x+1)}
$$

does not lie between 1 and 4 , if $x$ is real.
13. Find the number of 4 -letter words that can be formed using the letters of the word MIRACLE. How many of them :
(i) Begin with a vowel
(ii) Begin and end with vowels
(iii) End with a consonant.
14. Prove that :

$$
\frac{{ }^{4 n} \mathrm{C}_{2 n}}{{ }^{2 n} \mathrm{C}_{n}}=\frac{1.3 .5 \ldots \ldots \ldots(4 n-1)}{\{1.3 .5 \ldots \ldots \ldots .(2 n-1)\}^{2}}
$$

15. Resolve $\frac{3 x^{3}-2 x^{2}-1}{x^{4}+x^{2}+1}$ into partial fractions.
16. The probabilities of three mutually exclusive events are respectively given as $\frac{1+3 \mathrm{P}}{3}, \frac{1-\mathrm{P}}{4}, \frac{1-2 \mathrm{P}}{2}$. Prove that $\frac{1}{3} \leq \mathrm{P} \leq \frac{1}{2}$.
17. If A and B are independent events of a random experiment, show that $\mathrm{A}^{\mathrm{C}}$ and $\mathrm{B}^{\mathrm{C}}$ are also independent.
18. Long Answer Type Questions :
(i) Answer ANY FIVE questions.
(ii) Each question carries SEVEN marks.
19. If $\alpha, \beta$ are the roots of the equation $x^{2}-2 x+4=0$, then for any $n \in \mathrm{~N}$ show that :

$$
\alpha^{n}+\beta^{n}=2^{n+1} \cos \left(\frac{n \pi}{3}\right) .
$$

19. Find the polynomial equation whose roots are the translates of those of the equation :

$$
x^{4}-5 x^{3}+7 x^{2}-17 x+11=0 \text { by }-2 .
$$

20. If the coefficients of $x^{9}, x^{10}, x^{11}$ in the expansion of $(1+x)^{n}$ are in A.P., then prove that :

$$
n^{2}-41 n+398=0
$$

21. If

$$
x=\frac{1.3}{3.6}+\frac{1.3 .5}{3 \cdot 6.9}+\frac{1 \cdot 3 \cdot 5.7}{3 \cdot 6 \cdot 9 \cdot 12}+
$$

then prove that :

$$
9 x^{2}+24 x=11 .
$$

22. Find the mean deviation about median for the following continuous distribution :

Marks Obtained
$0-10 \quad 6$
10-20
8
$20-30 \quad 14$
30-40 16 $40-50 \quad 4$
$50-60 \quad 2$ urn $B_{2}$ contains 3 white and 4 black balls. One urn is selected at random and a ball is drawn from it. If the ball drawn is found black, find the probability that the urn chosen was $B_{1}$.
24. A random variable $X$ has the following probability distribution :

$$
\begin{array}{cc}
\mathbf{X}=\boldsymbol{x} & \boldsymbol{p}(\mathbf{X}=\boldsymbol{x}) \\
0 & 0 \\
1 & k \\
2 & 2 k \\
3 & 2 k \\
4 & 3 k \\
5 & k^{2} \\
6 & 2 k^{2} \\
7 & 7 k^{2}+k
\end{array}
$$

Find :
(i) $k$
(ii) the mean and
(iii) $p(0<\mathrm{X}<5)$.

