Total No. of Questions - 24

Total No. of Printed Pages - 4

Regd. No.

Part - III
MATHEMATICS, Paper - II (A)
(Algebra and Probability)
(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. Write the complex number $(1+2i)^3$ in the form of $a+ib$.

2. Express the complex number $1+i\sqrt{3}$ in modulus amplitude form.

3. If $1, \omega, \omega^2$ are the cube roots of unity, then prove that
$$\left(2-\omega\right)\left(2-\omega^2\right)\left(2-\omega^{10}\right)\left(2-\omega^{11}\right)=49$$

4. If $x^2-6x+5=0$ and $x^2-12x+p=0$ have a common root, then find p.

5. Form the polynomial equation of the lowest degree with roots as $0, 0, 2, 2, -2, -2$.

6. If $^nP_7 = 42 \cdot \left(^nP_5\right)$, then find n.

7. Find the value of $^{10}C_5 + 2 \cdot \left(^{10}C_4\right) + ^{10}C_3$.

8. Find the set E of the values of x for which the binomial expansion $(2+5x)^{\frac{-1}{2}}$ is valid.

9. Find the mean deviation about the mean for the following data :

   3, 6, 10, 4, 9, 10

10. The mean and variance of a binomial distribution are 4 and 3 respectively. Fix the distribution and find $P(X \geq 1)$.

<center>SECTION B   5 × 4 = 20</center>

II. **Short Answer Type Questions.**

   i) Attempt **any five** questions.

   ii) Each question carries **four** marks.

11. If $x + iy = \dfrac{3}{2 + Cos\theta + i\,Sin\theta}$ then, show that $x^2 + y^2 = 4x - 3$.

12. If x_1, x_2 are the roots of the quadratic equation $ax^2 + bx + c = 0$ and $c \neq 0$, find the value of $\left(ax_1 + b\right)^{-2} + \left(ax_2 + b\right)^{-2}$ in terms of a, b, c.

13. If the letters of the word EAMCET are permuted in all possible ways and if the words thus formed are arranged in the dictionary order, find the rank of the word EAMCET.

14. Prove that, $\dfrac{^{4n}C_{2n}}{^{2n}C_n} = \dfrac{1 \cdot 3 \cdot 5 \ldots (4n-1)}{\left[1 \cdot 3 \cdot 5 \ldots (2n-1)\right]^2}$.

15. Resolve the fraction $\dfrac{2x^2 + 2x + 1}{x^3 + x^2}$ into partial fraction.

16. A and B are events with $P(A) = 0.5$, $P(B) = 0.4$ and $P(A \cap B) = 0.3$. Find the probability that

    i) A does not occur   ii)   neither A nor B occurs

17. Find the probability of drawing an Ace or a Spade from a well shuffled pack of 52 playing cards.

SECTION C   5 × 7 = 35

III. Long Answer Type Questions.

    i)   Attempt **any five** questions.

    ii)   Each question carries **seven** marks.

18. If n is an integer then show that $(1 + Cos\,\theta + i\,Sin\,\theta)^n + (1 + Cos\,\theta - i\,Sin\,\theta)^n = 2^{n+1} Cos^n\left(\dfrac{\theta}{2}\right) Cos\left(\dfrac{n\theta}{2}\right)$

19. Show that $x^5 - 5x^3 + 5x^2 - 1 = 0$, has three equal roots and find that root.

20. If n is a positive integer, then prove that

$$C_0 + \frac{C_1}{2} + \frac{C_2}{3} + \ldots + \frac{C_n}{n+1} = \frac{2^{n+1} - 1}{n+1}$$

21. Find the sum of the series

$$\frac{3 \cdot 5}{5 \cdot 10} + \frac{3 \cdot 5 \cdot 7}{5 \cdot 10 \cdot 15} + \frac{3 \cdot 5 \cdot 7 \cdot 9}{5 \cdot 10 \cdot 15 \cdot 20} + \ldots \ldots \infty.$$

22. Calculate the variance and standard deviation of the following continuous frequency distribution :

Class interval	30–40	40–50	50–60	60–70	70–80	80–90	90–100
Frequency	3	7	12	15	8	3	2

23. State and prove Baye's theorem.

24.

$X = x$	−2	−1	0	1	2	3
$P(X = x)$	0.1	K	0.2	$2K$	0.3	K

is the probability distribution of a random variable X. Find the value of K and the variance of X.

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