Total No. of Questions – 24

Total No. of Printed Pages - 3

Regd. No.

Part - III

MATHEMATICS, Paper – II(A)

(English Version)

Time : 3 Hours]   [Max. Marks : 75

Note : This question paper consists of **three** Sections – **A**, **B** and **C**.

SECTION – A   10 × 2 = 20

I.   Very Short Answer Type questions :

   (i)   Answer **all** the questions.

   (ii)   Each question carries **two** marks.

1.   Find the multiplicative inverse of $7 + 24i$.

2.   If $Z_1 = -1$ and $Z_2 = + i$, then find $\text{Arg}\left(\dfrac{Z_1}{Z_2}\right)$

3.   If $1, w, w^2$ are the cube roots of unity, prove that $(1 - w + w^2)^6 + (1 - w^2 + w)^6 = 128$.

4.   If α, β are the roots of the equation $ax^2 + bx + c = 0$, find the value of $\dfrac{1}{\alpha^2} + \dfrac{1}{\beta^2}$ in terms of a, b, c.

5.   If the product of the roots of $4x^3 + 16x^2 - 9x - a = 0$ is 9, then find a.

6.   Find the number of ways of preparing a chain with 6 different coloured beads.

7.   If $^{12}C_{r+1} = {}^{12}C_{3r-5}$, find r.

8.   Find the set of 'x' for which the binomial expansion of $(2 + 3x)^{-\frac{2}{3}}$ is valid.

9.   Define the "Range" for an ungrouped data and also find the range of the given data :
      38, 70, 48, 40, 42, 55, 63, 46, 54, 44

10.   The probability that a person chosen at random is left handed (in handwriting) is 0.1. What is the probability that in a group of 10 people, there is one who is left handed ?

II. Short Answer Type questions :

(i) Attempt any **five** questions.

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

11. Show that the points in the Argand plane represented by the complex numbers $-2 + 7i$, $\frac{-3}{2} + \frac{1}{2}i$, $4 - 3i$, $\frac{7}{2}(1 + i)$ are the vertices of a rhombus.

12. Prove that $\frac{1}{3x + 1} + \frac{1}{x + 1} - \frac{1}{(3x + 1)(x + 1)}$ does not lie in between 1 and 4, if x is real.

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

14. A candidate is required to answer 6 out of 10 questions which are divided into two groups A and B each containing 5 questions. He is not permitted to attempt more than 4 questions from either group. Find the number of different ways in which the candidate can choose six questions.

15. Resolve $\frac{x^4}{(x - 1)(x - 2)}$ into partial fractions.

16. In a committee of 25 members, each member is proficient either in mathematics or in statistics or in both. If 19 of these are proficient in mathematics, 16 in statistics, find the probability that a person selected from the committee is proficient in both.

17. A speaks truth in 75% of the cases and B in 80% cases. What is the probability that their statements about an incident do not match ?

III. Long Answer Type questions :

(i) Attempt any **five** questions.

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

18. Show that one value of

$$\left(\frac{1 + \sin \frac{\pi}{8} + i \cos \frac{\pi}{8}}{1 + \sin \frac{\pi}{8} - i \cos \frac{\pi}{8}} \right)^{\frac{8}{3}} \text{ is } -1.$$

19. Find the polynomial equation whose roots are the translates of the roots of the equation $x^5 - 4x^4 + 3x^2 - 4x + 6 = 0$ by -3.

20. If the 2nd, 3rd and 4th terms in the expansion of $(a + x)^n$ are respectively 240, 720, 1080, find a, x, n.

21. If $x = \dfrac{1.3}{3.6} + \dfrac{1.3.5}{3.6.9} + \dfrac{1.3.5.7}{3.6.9.12} + \ldots\ldots\ldots$, then prove that $9x^2 + 24x = 11$.

22. Find the mean deviation from the mean of the following data, using step deviation method.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of Students	6	5	8	15	7	6	3

23. State and prove Baye's theorem.

24. A random variable 'X' has the following probability distribution :

X = x	0	1	2	3	4	5	6	7
P(X = x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$

Find :

(i)   K

(ii) The Mean and

(iii) $P(0 < x < 5)$