



विद्या सर्वार्थ साधिका

ANANDALAYA
MID TERM EXAM
Class : XI

Subject: Mathematics

Date : 27/09/2019

M.M: 40

Time: 2 Hours

General Instructions:

- All questions are compulsory.
- This question paper contains 18 questions.
- Questions 1- 8 in Section A are very short-answer type questions carrying 1 mark each.
- Questions 9-13 in Section B are short-answer type questions carrying 2 marks each.
- Questions 14-17 in Section C are long-answer I type questions carrying 4 marks each.
- Question 18 in Section D is long-answer II type question carrying 6 marks.

SECTION – A

- If $i = \sqrt{-1}$ then the value of $\frac{i^{4n+1} - i^{4n-1}}{2} =$ _____. (1)
a) 1 b) i c) -1 d) $-i$
- A credit card holder forgets the four digits PIN of his card, to operate the ATM. He knows that his PIN consists of distinct digits 7, 9, 5 and the first digit from left is 3. Find the possible number of trials that he has to perform. (1)
a) 24 b) 3 c) 6 d) 12
- If $nC_{10} = nC_{14}$, then $26C_n =$ _____. (1)
a) 325 b) 2925 c) 26 d) 24
- The solution set of the linear in-equation $\frac{5x-2}{3} - \frac{7x-3}{5} > \frac{x}{4}$ is _____. (1)
a) $(-4, \infty)$ b) $(4, \infty)$ c) $[4, \infty)$ d) $[-\infty - 4]$
- Find the middle term in the expansion of $\left(\frac{a}{x} + bx\right)^{12}$. (1)
- How many words can be made from the letters of the word DELHI, if L comes in the middle of every word? (1)
- Find the coefficient of x^8 in the expansion of $\left(x^2 - \frac{1}{x}\right)^{10}$. (1)
- If $z = (1 - i)^6 + (1 - i)$ then find the modulus of z . (1)

OR

If the multiplicative inverse of a complex number is $\frac{(\sqrt{3}+4i)}{19}$ where $i = \sqrt{-1}$, find the complex number.

SECTION –B

- If $3 + i x^2 y$ and $x^2 + y + 4i$ are conjugate complex numbers, then find the real values of x and y . (2)

OR

Show that: $(x + 1 + i)(x + 1 - i)(x - 1 + i)(x - 1 - i) = x^4 + 4$.

10. In how many ways 3 boys and 5 girls can be arranged in a row so that (2)
 i) no boys sit together ii) all the girls are together

OR

Find the number of words with or without meaning which can be made using all the letters of the word AGAIN. If these words are written as in a dictionary, what will be the 50th word?

11. Find a if the 17th and 18th terms of the expansion $(2 + a)^{50}$ are equal. (2)

OR

The coefficients of three consecutive terms in the expansion of $(1 + x)^n$ are in the ratio of 1 : 7 : 42 find n and r .

12. How many three digit odd numbers can be formed by using the digits 1, 2, 3, 4, 5, 6 when (2)
 (i) the repetition of digits is not allowed ?
 (ii) the repetition of digits is allowed ?

OR

Find n if ${}^{2n}C_3 : {}^nC_3 = 11:1$

13. If $a^2 + b^2 = 1$, prove that $\frac{1+b+ia}{1+b-ia} = b + ia$ (2)

SECTION – C

14. Find the value of k so that the term independent of x in the expansion of $\left(\sqrt{x} + \frac{k}{x^2}\right)^{10}$ is 405. (4)

OR

In $\left(\sqrt[3]{2} + \frac{1}{\sqrt[3]{3}}\right)^n$, if the ratio of 7th term from the beginning to the 7th term from the end is $\frac{1}{6}$, find the value of n .

15. By using Principle of Mathematical Induction, prove that for all $n \in \mathbb{N}$ (4)

$$1 + \frac{1}{1+2} + \frac{1}{1+2+3} + \dots + \frac{1}{1+2+3+\dots+n} = \frac{2n}{n+1}$$

OR

By using Principle of Mathematical Induction, prove that for $n \in \mathbb{N}$, $2 \times 7^n + 3 \times 5^n - 5$ is divisible by 24.

16. Find the square roots of the complex number $-3 - 4i$. (4)

17. There are 10 Teachers and 20 Students out of whom a committee of 2 Teachers and 3 Students is to be formed. Match the following columns I and II. Justify your answer. (4)

| I | II |
|---|------------------------------------|
| a) In how many ways committee can be formed | i) ${}^{10}C_2 \times {}^{19}C_3$ |
| b) In how many ways a particular Teacher is included. | ii) ${}^{10}C_2 \times {}^{19}C_2$ |
| c) In how many ways a particular Student is included | iii) ${}^9C_1 \times {}^{20}C_3$ |
| d) In how many ways a particular Student is excluded | iv) ${}^{10}C_2 \times {}^{20}C_3$ |

SECTION – D

18. Solve the system of inequalities graphically: $3x + 2y \leq 150$, $x + 4y \leq 80$, $x \leq 15$, $x \geq 0$, $y \geq 0$. (6)