

Indian Statistical Institute
Documentation Research and Training Centre
MS(LIS) (2019-21)
First Semester Final term Examination
Paper: 6 Elements of Mathematics- I

Date: 11/11/2019

Max. Marks: 60

Time: 3 hrs

Note: All the questions are compulsory. Questions 3, 4, 5, 6, 9, and 10 have choice. attempt one from each.

Question 1: Find the roots of the quadratic equation

i. $6x^2 - x - 2 = 0$

ii. $3x^2 - 2\sqrt{6}x + 2 = 0$.

[5]

Question 2: Solve each of the following equations: $2x^2 + x + 1 = 0$, and $x^2 + 3x + 9 = 0$.

[5]

Question 3: Determine n if

i. ${}^{2n}C_3 : {}^nC_3 = 12 : 1$

ii. ${}^{2n}C_3 : {}^nC_3 = 11 : 1$

[5]

OR

Question 3: A rectangular park is to be designed whose breadth is 3m less than its length. Its area is to be 4 square metres more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the rectangular park and of altitude 12m. Find its length and breadth.

[5]

Question 4: A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If the total cost of production on that day was Rs 90, find the number of articles produced and the cost of each article.

[5]

OR

Question 4: If the sum of first p terms of an A.P. is equal to the sum of the first q terms, then find the sum of the first (p + q) terms.

[5]

Question 5: Find the roots of $4x^2 + 3x + 5 = 0$ by the method of completing the square.

[5]

OR

Question 5: Write the first three terms in each of the following sequences defined by the following:

i. $a_n = (n - 3)/4$

ii. $a_n = (-1)^{(n-1)} 5^{n+1}$

[5]

Question 6: (i) Find the conjugate of $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$

(ii) Convert the complex number $\frac{i-1}{\cos(\frac{\pi}{3})+i\sin(\frac{\pi}{3})}$ in the polar form. [10]

OR

Question 6: (i) Prove that ${}^n C_r + {}^n C_{r-1} = {}^{n+1} C_r$
(ii) Find the value of n in ${}^n C_{70} + {}^n C_{69} = {}^{101} C_{70}$ [7+3]

Question 7: In how many ways can a student choose a programme of 5 courses if 9 courses are available and 2 specific courses are compulsory for every student? [5]

Question 8: In how many ways can the letters of the word PERMUTATIONS be arranged if the
i. words start with P and end with S, and
ii. vowels are all together [5]

Question 9: Find the sum of the sequence 7, 77, 777, 7777, ... to n terms. [5]

OR

Question 9: Is the following situation possible? If so, determine their present ages. The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years was 48. [5]

OR

Question 9: The sums of n terms of two arithmetic progressions are in the ratio $5n + 4 : 9n + 6$. Find the ratio of their 18 th terms. [5]

Question 10: The income of a person is Rs. 3,00,000, in the first year and he receives an increase of Rs.10,000 to his income per year for the next 19 years. Find the total amount, he received in 20 years. [10]

OR

Question 10: What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these

- i. four cards are of the same suit,
 - ii. four cards belong to four different suits,
 - iii. are face cards,
 - iv. two are red cards and two are black cards,
 - v. cards are of the same colour?
- [10]