Total No. of Questions : **16**]　　　　　　　[Total No. of Printed Pages : **4**

SEM–1029

M.Sc. (Ist Semester) Examination, 2022
COMPUTER SCIENCE

Paper – FS-COMP-MSC-CC-101

(Mathematics for Computer Science)

Time : 3 Hours]　　　　　　　　　　[*Maximum Marks : 40*

This question paper contains three Sections.

Section–A　　　　　　**(Marks : 1 × 10 = 10)**

Note :–　The candidate is required to answer all the *ten* questions carries **1** mark each. The answer should not exceed **50** words.

Section–B　　　　　　**(Marks : 3 × 5 = 15)**

Note :–　The candidate is required to answer *five* questions by selecting at least *one* question from each Unit. Each question carries **3** marks. Answer should not exceed **200** words.

Section–C　　　　　　**(Marks : 5 × 3 = 15)**

Note :–　The candidate is required to answer *three* questions by selecting *one* question from each Unit. Each question carries **5** marks. The answer should not exceed **500** words.

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Section–A

1. (i) State pigeonhole principle.

   (ii) Find the value of the following binomial coefficient :

   $$\binom{5}{2}$$

   (iii) What do you mean by position vector ?

   (iv) Define tautology with an example.

   (v) What do you mean by Turing Machine ?

   (vi) Write Truth table for biconditional statement.

   (vii) Define Hasse diagram with an example.

   (viii) What do you mean by 'Big O' notation ?

   (ix) Define transitive closure.

   (x) What is the order of resulting matrix :

   $$[M_1]_{2\times 5} \times [M_2]_{5\times 11}$$

Section–B

Unit–I

2. Write the powerset of set A = {1, 2, 5}. In general, what is the cardinality of powerset of a set with n elements.

3. Find the middle terms of the expansion of the expression :

$$(x - y)^7$$

4. How many different words (permutations) are possible, using the letters of word 'mscmgsu' ?

Unit–II
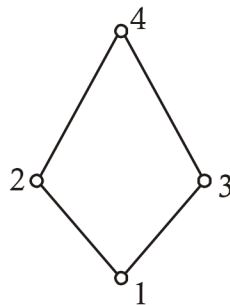
5. Prove the following using mathematical induction :

$$1.2 + 2.3 + 3.4 + \ldots\ldots\ldots + n(n+1) = \frac{(n)\,(n+1)\,(n+2)}{3}$$

for all integers $n \geq 1$.

6. Explain the concept of quantifiers with suitable example.

7. Explain the types of languages as per Chomsky hierarchy.

Unit–III

8. Find out all the valid tuples of relation R, for which Hasse diagram is given as the following :

9. Find the equation of line passing through points (1, 2) and (9, 10).

10. Explain the concept of one-to-one function with suitable example.

Section–C

Unit–I

11. Find the scalar and vector product of the following vectors :

$$\vec{a} = 2\hat{i} + 5\hat{j} - 6\hat{k}$$

$$\vec{b} = -9\hat{j} + \hat{k}$$

12. A class has 25 students. For a school event, 10 students need to be chosen from this class. 4 of the students of the class decide that either four of them will participate in the event or none of them will participate. What are the possible combination of 10 students ?

Unit–II

13. Explain any *two* models of computation in computability theory.

14. Explain the concept of logical equivalence with suitable examples and truth table for the same.

Unit–III

15. Draw the Hasse diagram for relation ({3, 4, 12, 24, 48, 72}, divides). Find the upper and lower bounds of {12, 24}.

16. If the center of a circle is at (1, 4) and the diameter of the circle is 5, what is the equation of that circle ?