

Roll No :

Total No. of Questions : 10]

[Total No. of Printed Pages : 4

SP-703

M.Sc. (Final) Examination, 2021

COMPUTER SCIENCE

Paper - MCS-204

(Discrete Mathematics)

(For Due and Imp. Student Only)

Time : 1½ Hours]

[Maximum Marks : 100

Note :- Attempt *five* questions in all, selecting *one* question from each Unit. All questions carry equal marks.

Unit-I

1. (a) Prove the following using mathematical induction :

$3^n - 1$ is a multiple of 2 where n is a natural number. 10

(b) (i) Write the truth table for conditional statement.

(ii) What do you mean by empty sets ?

(iii) Write *two* differences between a set and multi-set.

(iv) What do you mean by Venn diagrams ?

(v) What do you mean by compound proportions ? 2×5=10

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(1)

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2. (a) Prove the following using mathematical induction :

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1}$$

for all $n \geq 1$.

10

- (b) Explain the following in brief :

- (i) Universal set
- (ii) Partition of a set
- (iii) Finite sets
- (iv) Tautology
- (v) Logical equivalence

2×5=10

Unit-II

3. (a) Explain the concept of complexity of algorithms in detail.
- (b) Explain pictorial and matrix representations of a relation in detail. 10,10
4. (a) What are *three* different properties of the equivalence relation ? Give a suitable example.
- (b) Explain the concept of recursively defined function with suitable example.
- (c) Explain the differences between a function and a relation, using suitable examples.
- (d) Let domain of a function contains elements {1, 2, 3} and codomain contains {X, Y, Z}. Is this a one-one and onto functions ? Justify. 5,5,5,5

Unit-III

5. (a) Define a poset and explain its properties with suitable example.
(b) What are the conventions used in a Hasse diagram ?
(c) Describe the concept of sum of products form.
(d) Minimize the following Boolean function using sum of products (SoP) :

$$Z(A, B, C) = \Sigma(1, 3, 6, 7) \quad 5,5,5,5$$

6. (a) Explain the concept of k-map using a suitable example.
(b) How do you identify supremum and infimum of a poset ?
(c) Draw the Hasse diagram for the partial ordering $\{(a, b) | a|b\}$ on the set $\{1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60\}$. Here $a|b$ means a divides b . Find the infimum and supremum, if possible. 5,5,10

Unit-IV

7. (a) Expand the following using binomial theorem :

$$(x - y)^6$$

- (b) Find the middle terms in the expansion of $(2x - 3y)^4$.
(c) How many different permutations and possible using the letters of word 'EXAMINATION' ?
(d) Explain the concept of Pigeon-hole principle using suitable example. 5,5,5,5
8. (a) How many words of 3 consonants and 2 vowels can be formed, out of given 7 consonants and 4 vowels ?
(b) Prove the following binomial identity :

$$\sum_{r=0}^n \binom{n}{r} = 2^n \quad 10,10$$

Unit-V

9.

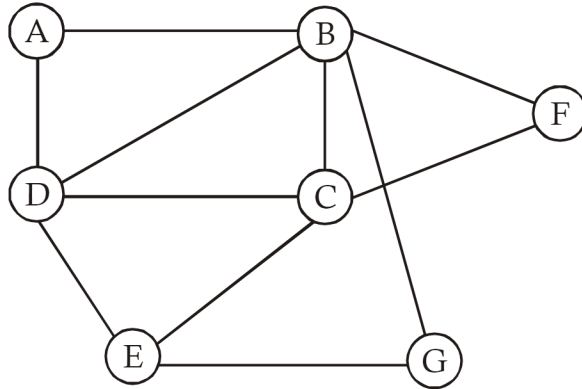


Fig.1

Given the graph in Fig. 1, find the following :

(a) DFS traversal with steps

(b) BFS traversal with steps

10×2=20

10. Write the short notes on each of the following with examples :

(a) Spanning tree

(b) Prim's algorithm

(c) Bipartite graphs

(d) Isomorphic graphs

(e) Adjacency matrix

4×5=20