B.C.A. (PART-I) 2nd Semester Examination, 2022

B.C.A.

(Discrete Mathematics)

BCA-201

Time : Three Hours] [Maximum Marks : 70

Note: (i) Answer **five** questions in all.

(ii) Question **No. 1** is compulsory.

(iii) Answer two questions from section **A** and **B** each.

(iv) All questions carry equal marks.

1. Answer any four parts of the following:

(a) If set $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$ then find the value of A-B and B-A.

(b) Prove that the fourth root of unity $1, -1, i, -i$ form the abelian multiplicative group.

(c) If the preposition "x^2 is divided by 4" is given, then prove that x is even.

(d) Find recurrence relation of the Fibonacci series $s = \{1, 1, 2, 3, 5, 8, - - - -\}$.

(e) What is complete graph and regular graph?

SECTION-A

2. What is an equivalence relation? Show that if a relation on a set $A = \{1, 2, 3\}$ is satisfying an identify relation then the relation is also equivalence

3. Four girls and five boys are to be arrange in straight line. Find how many ways this can be done with following conditions:

   (i) Without any restriction

   (ii) If all the boys sit together

   (iii) If all girls and boys sit together

   (iv) If no girls sit together

4. Obtain the principal disjunctive normal form and principal of conjunctive normal form of the following: $((Q \vee \sim R) \Rightarrow P) \wedge (Q \Leftrightarrow R)$

5. Solve the recurrence relation $a_{n+2} - 5a_{n+1} + 6a_n = 2$ with initial condition $a_0 = 1$, and $a_1 = -1$
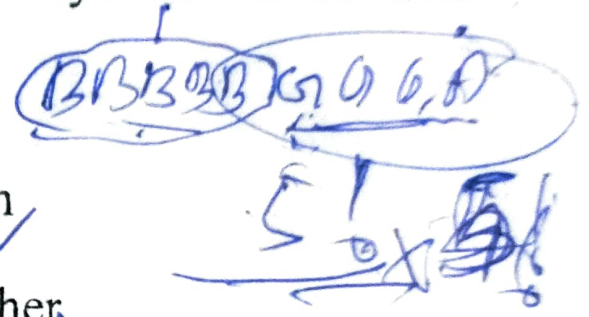
SECTION–B

6.   (a)   Given function $f(x) = \frac{1}{1+x^2}$, $g(x) = 2x + 3$ find :

       (i) $f^{-1}(x)$

       (ii) $g^{-1}(x)$

       (iii) $fog\,(x)$

       (iv) $gof\,(x)$

   (b)   State and prove "De Morgan Law".

7.   (a)   Construct truth table for $(p \Leftrightarrow q) \Leftrightarrow (p \wedge \sim q)$

   (b)   What do you mean by Tautology? Prove that the formula $(x \Rightarrow y) \vee (y \Rightarrow x)$ is a tautology.
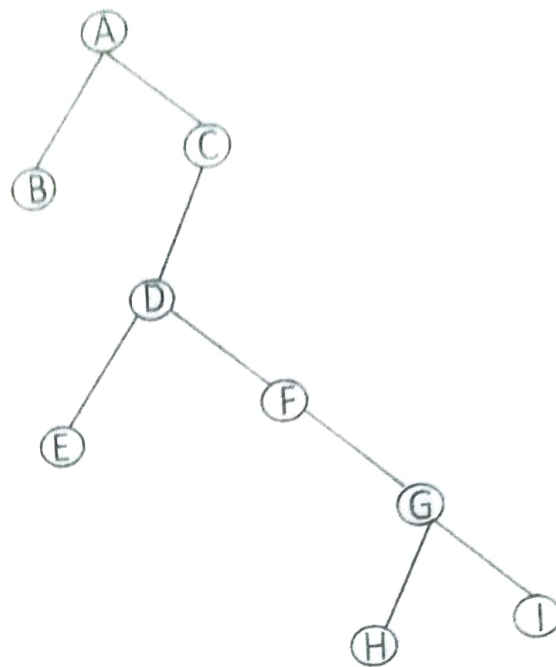
8.   (a)   Find the tree traversal of the given tree in the following order :

       (i)   Pre order

       (ii)   In order

       (iii)   Post order

(b) Explain elementary properties of a Graph. Describe any two of them.

9. Attempt **any two** of the following:

(a) Find n and x if $nc_x = 56$ and $nP_x = 336$.

(b) Explain Bijective function.

(c) Write notes on types of graph.

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B.C.A. (PART-I) EXAMINATION, 2022-23

(Second Semester)

Paper : I

BCA-201 : Discrete Mathematics

Time : Three Hours]　　　　　　　[Maximum Marks : 70

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Note: (i)　Answer **Five** Questions in all.

(ii)　Question No.1 is **Compulsory**.

(iii)　Answer remaining **four** questions, selecting **two** questions from each Section A and B.

(iv)　All questions carry equal marks.

I.　Answer all parts of the following :

(a)　Describe Depth First Search (DFS) strategy.

(b)　If $^nP_4 = 20 \times {}^nP_2$, then find n.

(c)　By an example distinguish Kauskal's and Prim's algorithm.

(d) Let f be defined recursively by $f(n + 1) = 2f(n) + 1$ and $f(0) = 3$.

Evaluate $f(1), f(2), f(3)$ and $f(4)$

SECTION - A

2. Show that the maximum number of edges in a simple undirected graph with n vertices is $\frac{n(n-1)}{2}$.

3. In mathematical logic, define the term 'statement' and explain about 'compound statement'. What do you mean by truth table ? Construct truth table for the following statement $(P \rightarrow Q) \wedge (Q \rightarrow P)$.

4. For the given following graph :
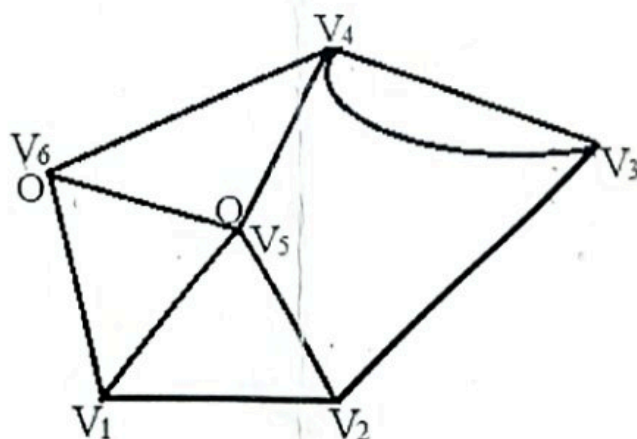
Find (i) Order of the graph

(ii) Parallel edges

(iii) Isolated vertices

(iv) Adjacent vertices

(v) Incident edges

(vi) Degree of every vertex

and write down vertices of odd and even degree.

5. With the help of mathematical induction prove that for each integer n, $n^2 - 2$ is not divisible by 3.
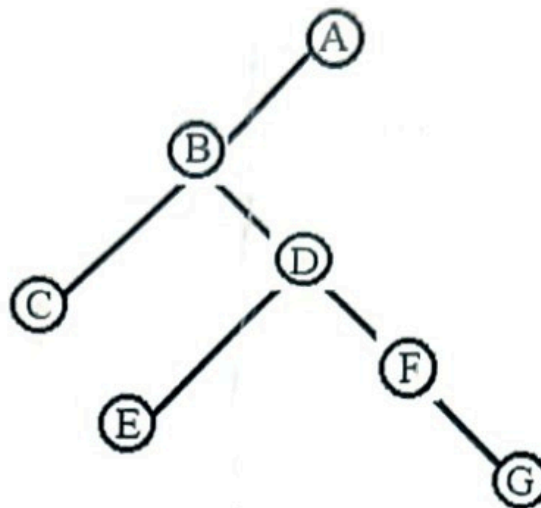
SECTION - B

6. (a) Define Minimum Spanning Tree (MST). Explain the method of generating a Broadth First Search (BFS) based MST of a graph.

(b) Find the tree traversal of the following tree in :

(i) Pre order

(ii) In order

(iii) Post order

7. (a) Describe different types of function in brief.

(b) Define equivalence relation with suitable example.

8. (a) Draw a tree with at least 6 vertices that has exactly 2 vertices of degree 1.

(b) What do you mean by group ? Discuss the properties of abelian group.

9. Write notes on any two of the following :

(a) Complete Binary Tree

(b) Tautology

(c) Recurrence Relation

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