## University of Dhaka Affiliated Engineering Colleges Department of Computer Science and Engineering 1<sup>st</sup> Year 1<sup>st</sup> Semester B.Sc. Examination, 2020 CSE - 1102, Discrete Mathematics

1. a) Define Set with example. Prove that  $|A_1 \cup A_2| = |A_1 + A_2| - |A_1 \cap A_2|$ , where  $A_1$  and  $A_2$  be

Total Marks: 70 (Answer any 3 (Three) of the following Questions)

Time: 2 Hours

2+

Print

6 9

5

6

6

10

**Print** 

2+

6

4

6

3+3

3+6

8.33

6 9

3.33

5

**Print** 

10

3.33

2+4

4

5.33

Time: 2 Hours

**Print** 

	sets with cardinalities $ A_1 $ and $ A_2 $ .	5	5.33
b)	Explain Venn Diagram for Union and Intersection operations where A and B sets.	are two	6
c)	Write down the Laws of set theory.		4
d)	Consider Universal set U and two sets A and B. Shade the following sets using Ven Diagram:		6
	i) $A \cap B^C$ ii) $(B/A)^C$		

2. a) What is recursion? A function f is defined recursively by f(0) = 3, f(n+1) = 2f(n)+3; 3+3Find the value of f(4). b) What is recurrence relation? Obtain the recurrence relation for: 3+6 $G(k) = 2.4^k - 5.(-3)^k$ Find the solution to the recurrence relation:  $a_{n}=6a_{n-1}-11a_{n-2}+6a_{n-3}$  with the initial 8.33 conditions  $a_0=2$ ,  $a_1=5$  and  $a_2=15$ 

3. a) Define reflexive, symmetric and transitive relation. Consider the following five relations on the set  $A = \{1, 2, 3, 4\}$ :  $R = \{(1, 1), (1, 2), (2, 3), (1, 3), (4, 4)\}$  $S = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$  $T = \{(1, 3), (2, 1)\}$  $U = A \times A$ , the universal relation  $V = \emptyset$ , the empty relation Determine whether or not each of the above relations on A is i) Reflexive ii) Symmetric iii) Transitive Define Equivalence relation with example. 3.33 Let  $A = \{1,2,3,4\}$ ,  $B = \{4,5,6\}$  and  $C = \{6,7,8\}$ . R is a relation from A to B and S is a relation from B to C, which is given by  $R = \{(x,y): x + y = 7\}$  $S = \{(x,y): y - x = 1\}$ Determine R and S.

4 Let  $A = \{1,2,3\}$  and R be the relation,  $R = \{(1,2), (1,3), (2,2), (2,3), (3,3)\}$ . Draw the diagraph by using this relation. Define tautology and contradiction with examples. Verify that  $(p \land q) \land \neg (p \lor q)$  is a 4+ contradiction by using truth table. 3.33

State the converse, contrapositive and inverse of the following conditional statements:

i) If it snows tonight, then I will stay at home.

ii) I go to the beach whenever it is a sunny summer day.

State and proof the Principle of Inclusion and Exclusion.

4. a)

5. a)

Define with figure:

i) Graph ii) Subgraph

iii) Bipartite graph iv) Complete graph v) Directed graph b) Draw the graph G corresponding to the adjacency matrix: 3.33  $A = \left[ \begin{array}{rrrr} 1 & 3 & 0 & 0 \\ 3 & 0 & 1 & 1 \\ 0 & 1 & 2 & 2 \\ 0 & 1 & 2 & 3 \end{array} \right]$ What is isomorphism? Draw two graphs that are isomorphic and describe briefly. d) Represent the graph with an incidence matrix.



## conditions $a_0=2$ , $a_1=5$ and $a_2=15$ Define reflexive, symmetric and transitive relation. b) Consider the following five relations on the set $A = \{1, 2, 3, 4\}$ : $R = \{(1, 1), (1, 2), (2, 3), (1, 3), (4, 4)\}$ $S = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$ $T = \{(1, 3), (2, 1)\}\$

d) Let  $A = \{1,2,3,4\}$ ,  $B = \{4,5,6\}$  and  $C = \{6,7,8\}$ . R is a relation from A to B and S is a

c) Find the solution to the recurrence relation:  $a_{n=1} 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$  with the initial

University of Dhaka Affiliated Engineering Colleges

Department of Computer Science and Engineering 1<sup>st</sup> Year 1<sup>st</sup> Semester B.Sc. Examination, 2020

CSE - 1102, Discrete Mathematics

(Answer any 3 (Three) of the following Questions)

1. a) Define Set with example. Prove that  $|A_1 \cup A_2| = |A_1 + A_2| - |A_1 \cap A_2|$ , where  $A_1$  and  $A_2$  be

b) Explain Venn Diagram for Union and Intersection operations where A and B are two

d) Consider Universal set U and two sets A and B. Shade the following sets using Venn

ii) (B/A)<sup>C</sup>

What is recursion? A function f is defined recursively by f(0) = 3, f(n+1) = 2f(n)+3;

Total Marks: 70

sets.

2. a)

3. a)

Diagram:

sets with cardinalities  $|A_1|$  and  $|A_2|$ .

c) Write down the Laws of set theory.

i)  $A \cap B^C$ 

b) What is recurrence relation? Obtain the recurrence relation for:

Determine whether or not each of the above relations on A is

 $G(k) = 2.4^k - 5.(-3)^k$ 

 $U = A \times A$ , the universal relation

c) Define Equivalence relation with example.

relation from B to C, which is given by

 $R = \{(x,y): x + y = 7\}$  $S = \{(x,y): y - x = 1\}$ 

Determine R and S.

Define with figure:

i) Graph ii) Subgraph

iii) Bipartite graph iv) Complete graph v) Directed graph

 $A = \left[ \begin{array}{rrrr} 1 & 3 & 0 & 0 \\ 3 & 0 & 1 & 1 \\ 0 & 1 & 2 & 2 \\ 0 & 1 & 2 & 0 \end{array} \right]$ 

c)

b) Draw the graph G corresponding to the adjacency matrix:

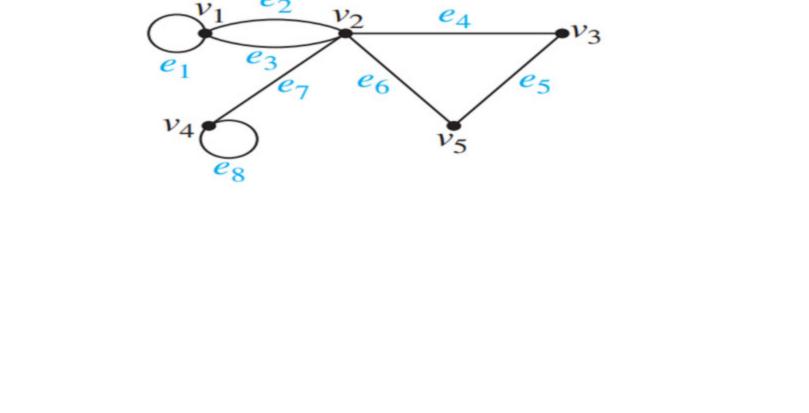
Represent the graph with an incidence matrix.

i) Reflexive ii) Symmetric iii) Transitive

 $V = \emptyset$ , the empty relation

Find the value of f(4).

6 State the converse, contrapositive and inverse of the following conditional statements: 4. a) i) If it snows tonight, then I will stay at home. ii) I go to the beach whenever it is a sunny summer day. b) State and proof the Principle of Inclusion and Exclusion. 6 4 Let  $A = \{1,2,3\}$  and R be the relation,  $R = \{(1,2), (1,3), (2,2), (2,3), (3,3)\}$ . Draw the diagraph by using this relation. Define tautology and contradiction with examples. Verify that  $(p \land q) \land \neg (p \lor q)$  is a 4+ 3.33 contradiction by using truth table.



What is isomorphism? Draw two graphs that are isomorphic and describe briefly.

4