



Bahria University, Islamabad Campus

Department of Computer Science

Final Term Examination

GSC 221/ Section 2A/2B

Paper Type: Descriptive

Course: Discrete Mathematics

Date: 12 February 2022

Course Code: GSC 221

Time Allowed: 2.5 Hours

Faculty's Name: Faisal Asad / Sara Mehmood

Max Marks: 50

Total Pages: 3 (Including this)

INSTRUCTIONS:

- I. All questions are compulsory.
- II. There is total 4 questions.
- III. The paper is closed book.
- IV. Students are not allowed to use any helping material (books, tables, formulas, etc.)
- V. Calculators are allowed. However, Programmable Calculators are NOT allowed.
- VI. Use blue, black or blue-black ink only. **Do NOT use lead pencil.**

Student's Name: _____ Enrollment No: _____

(USE CAPITAL LETTERS)

Question (1)

Prove the following:

[8 Marks]

a. $(\sim p \wedge q) \wedge (\sim p \vee q) \equiv c$

b. $(p \wedge q) \vee (\sim p \vee (p \wedge \sim q)) \equiv t$

Given p and q :

p	q
T	T
T	F
F	T
F	F

Question (2)

[12 Marks]

Simplify the following using rules of Logic

- a) $(p \vee q) \rightarrow (\sim p \wedge q)$
- b) $p \wedge q \rightarrow \sim p$
- c) $p \rightarrow \sim p \wedge q$
- d) $(p \rightarrow r) \leftrightarrow (q \rightarrow r)$

Question (3)

Part 1) Use mathematical induction to prove that for all integers $n > 1$:

[20 Marks]

- a) $1 + 3 + 5 + 7 + \dots + (2n-1) = n^2$
- b) $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$

Part 2) Give a recursive definition of the following sets of objects:

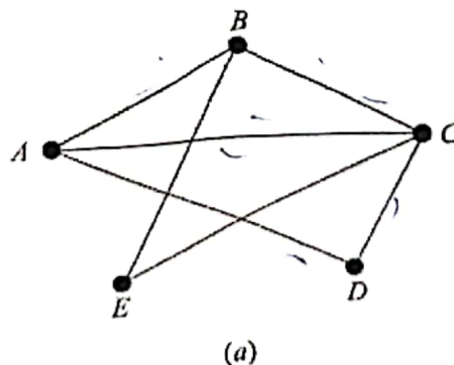
- a) $2, 1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$
- b) $1, 2, 4, 7, 11, 16, 22, \dots$ ✓

Question (4)

Part 1) For Graph "a", Identify:

[10 Marks]

- a) All the closed paths that include vertex A.
- b) The shortest path from A to E
- c) All trails from A to E



Part 2) Draw the directed graph for the following adjacency matrix (just use 0 to 5 nodes and ignore the 6,7,8 and 9 nodes):

	0	1	2	3	4	5	6	7	8	9
0	0	1	0	0	0	0	1	0	1	0
1	1	0	0	0	1	0	1	0	0	1
2	0	0	0	0	1	0	1	0	0	0
3	0	0	0	0	1	1	0	0	1	0
4	0	1	1	1	0	1	0	0	0	1
5	0	0	0	1	1	0	0	0	0	0
6	1	1	1	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	1	1
8	1	0	0	1	0	0	0	1	0	0
9	0	1	0	0	1	0	0	1	0	0