



Department of Basic Sciences
Discrete Math II - Second Exam - Semester (2) - 2017/2018

Name:

Student's Number:

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1. Consider the Boolean function $F(x, y, z) = \bar{x}(\bar{x} + yz) + \bar{x}\bar{y}$.
- a. Find the complement function $\bar{F}(x, y, z)$ of F . [1]
- b. Find the duality function $F^d(x, y, z)$ of F . [1]
- c. Use identity approach with detailed steps to show that $F(x, y, z) = \bar{x} + \bar{y}$. [2]
- d. Represent $F(x, y, z)$ as the sum of products. [2]
2. Find $F(x, y)$ as a Boolean function of x and y , given that [2]

$$F(1, 1) = 0, F(1, 0) = 1, F(0, 1) = 1, F(0, 0) = 0.$$

3. A digraph G with ordered set of vertices $\{a, b, c, d\}$ has adjacency matrix given by

$$A_G = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0 \end{bmatrix}$$

Answer the following questions showing your explanation.

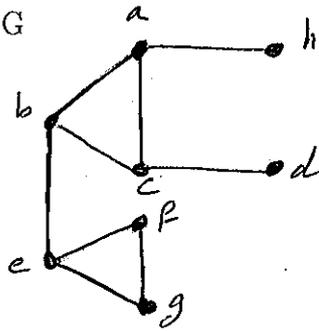
a. Is the graph simple or multiple? [1]

b. Is the graph weakly connected? [1]

c. Is the graph strongly connected? Find the number of strongly connect components. [3]

d. What is the length of shortest path from d to c , and how many such paths? Give your answer using A_G . [2]

4. Consider the graph G



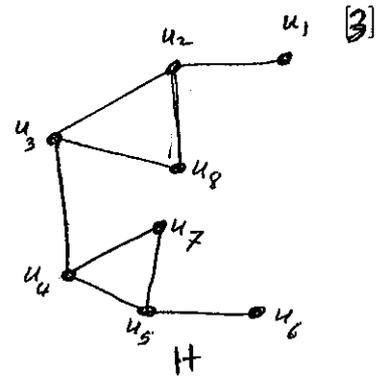
a. Find the cut vertices of this graph.

[1]

b. Find the cut edges of this graph.

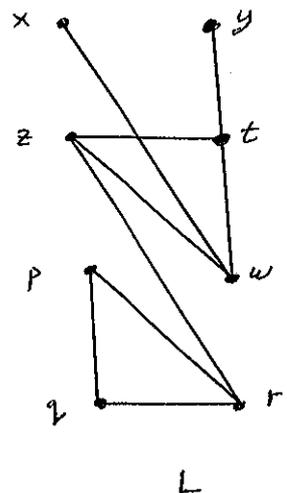
[1]

c. Give a reason why G is not isomorphic to the graph H given by



d. Show that G is isomorphic to the graph L given by

[3]



5. Let G be a simple undirected graph whose adjacency matrix contains a row with all entries are zeros. Show that the complement graph \bar{G} is connected. [2]

Extra Space