



Sri Lanka Institute of Information Technology

B.Sc. Special Honors Degree/ Diploma  
in  
Information Technology

Final Examination  
Year 1, Semester I (2018)

IT 1030 – Mathematics for Computing

Duration: 2 Hours

June, 2018

Instructions to Candidates:

- ◆ This paper contains 4 questions.
- ◆ **Answer all** the questions in the paper itself.
- ◆ Total marks for the paper is 100 and the paper carries 50% weight for the final mark.
- ◆ This paper contains 9 pages without the cover page.
- ◆ Calculators are not allowed.

**Question 01****25 marks**

- a) Prove the following Boolean equation using laws of Boolean algebra. (5 marks)

$$(\overline{AB} + \overline{A} + AB) = 0$$

- b) In a version of the computer language BASIC, the name of a variable is a string of one or two alphanumeric characters, where uppercase and lowercase letters are not distinguished. (An alphanumeric character is either one of the 26 English letters or one of the 10 digits.) Moreover, a variable name must begin with a letter and must be different from the five strings of two characters that are reserved for programming use. How many different variable names are there in this version of BASIC?

(6 marks)

- c) Expand the following using Binomial Theorem.  
 $(3x + 4)^3$

(6 marks)

- d) Differentiate the following.

(8 marks)

$$f(x) = (\sqrt{x^4 + 1}) \cdot (x^3 - 2x^2 + 1)$$

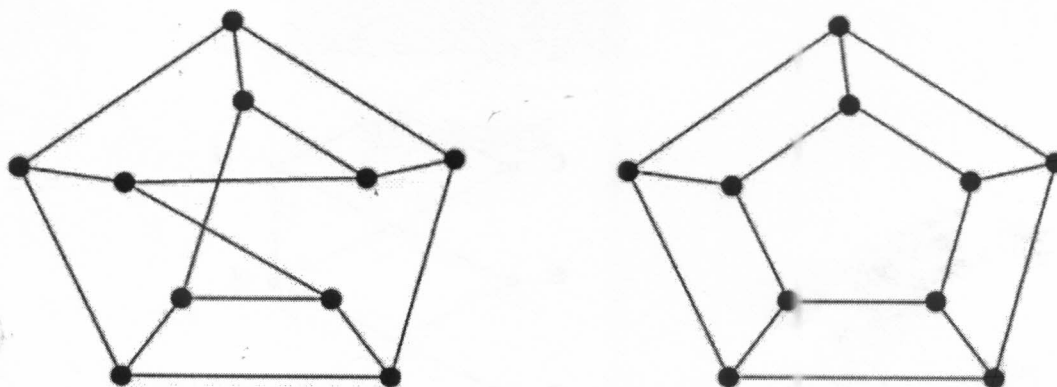
**Question 02****25 marks**

- a) Find the inverse of the following function

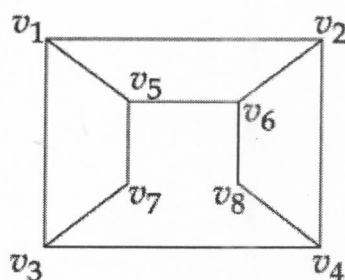
(8 marks)

$$f: R \rightarrow R \qquad f(x) = -\frac{1}{3}x + 1$$

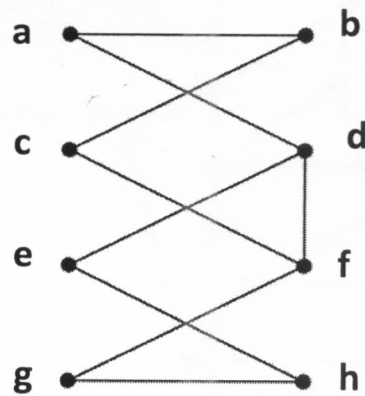
- b) Determine whether the following graphs are isomorphic. If they are not give an isomorphic invariant that they do not share. (4 marks)



- c) Determine whether the given graph has a Hamilton circuit or path. Construct such a circuit or path if it exists. (4 marks)



- d) Determine whether the given graph has an Euler circuit. Construct such a circuit if it exists. If no Euler circuit exists, determine whether the graph has an Euler path and construct such path if one exists. (4 marks)

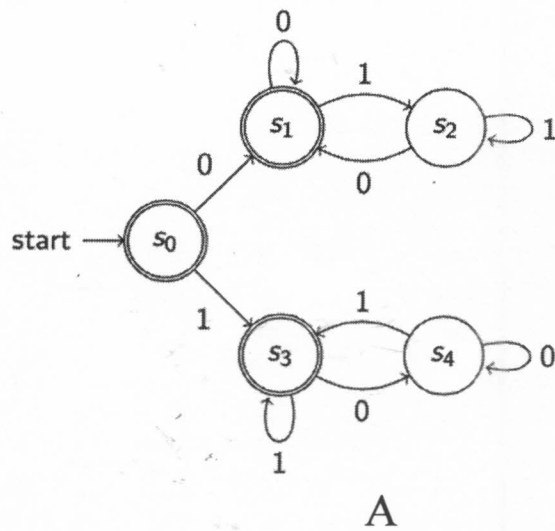


- e) Draw a graph with the degree sequence 5, 4, 3, 3, 1. If a graph cannot be drawn give reasons. (5 marks)

**Question 03****25 marks**

- a) Evaluate the following definite integral  $\frac{1}{2} \int_1^2 ((x^2 - x) + |2x|) dx$ . (8 marks)

- b) Consider the following finite state machine. (12 marks)



- i) What is the initial state of A? (1 marks)

- ii) What are the states of A? (2 marks)

iii) What are the input symbols of A? (2 marks)

iv) What are the accepting states of A? (2 mark)

v) Find the annotated next state table for A. (5 marks)

c) Draw the graph for the following adjacency matrix. (5 marks)

$$A = \begin{pmatrix} 1 & 3 & 2 & 4 \\ 3 & 0 & 2 & 1 \\ 2 & 2 & 2 & 3 \\ 4 & 1 & 3 & 1 \end{pmatrix}$$



**Question 04****25 marks**

- a) Using Cramer's rule find the solution of the following system of linear equations.

$$3x - 2y + 5z = 2$$

$$4x - 7y - z = 19$$

$$5x - 6y + 4z = 13$$

(10 marks)

- a. Chris invests \$2,200 into two accounts that pay 6% and 9% in annual interest. If his total interest for the year is \$168, how much is invested at each rate?
- i. Write down 2 equations to find how much is invested at each rate. (2 marks)

ii. Write the above two equations in matrix form.

(2 marks)

iii. Find the inverse of the coefficient matrix  $A$ .

(5 marks)

iii. Find how much is invested at each rate?

(6 marks)

*End of the Paper*