Sri Lanka Institute of Information Technology

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

Final Examination
Year 1, Semester I (2017)

IT 1030 – Mathematics for Computing

Duration: 2 Hours

May 2017

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 8 pages without the cover page.
- Calculators are not allowed.

Question 01 — 25 marks

a) Using NAND gates, draw the circuits to obtain these outputs. (10 marks)

i. $x + y$

ii. $x \,.\, y$

b) Prove the following Boolean equation using laws of Boolean algebra. (9 marks)

$$(\bar{a}.\bar{b} + c)(a + b)(\overline{\bar{b} + ac}) = cb(a + b)(\bar{a} + \bar{c})$$

c) Expand the following. (6 marks)

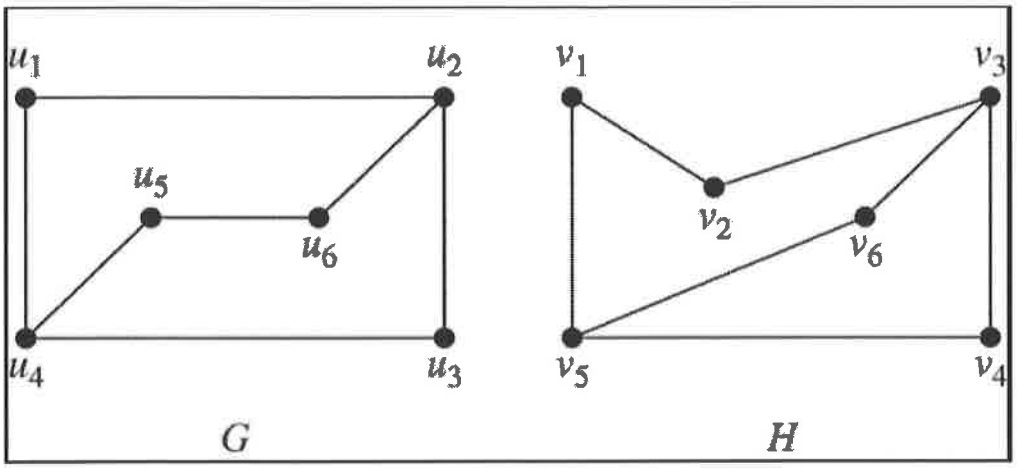
$(2x - 5)^4$

Question 02 — 25 marks

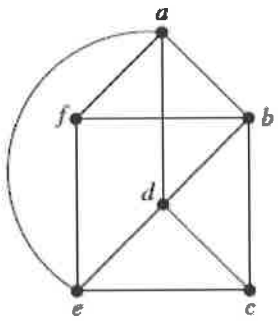
a) Find the inverse of the following function (8 marks)

$$f: R \to R \qquad f(x) = \frac{x}{4} + \frac{3}{4}$$

b) Determine whether the following graphs are isomorphic. If they are not give an isomorphic invariant that they do not share. (8 marks)



c) 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)



d) Draw a graph with the degree sequence 6, 5, 4, 3, 3, 1. If a graph cannot be drawn give reasons. If it can be drawn, state whether or not it is simple. (5 marks)

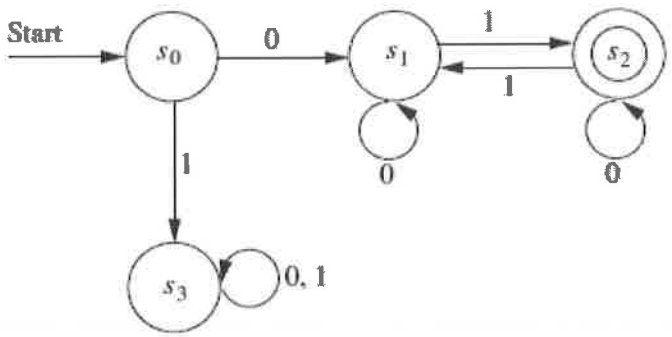
Question 03 — 25 marks

a) Evaluate the following definite integral $\int_0^2 (x^2 + 2) + |x + 4|\, dx$. (6 marks)

b) Assume that the following 5 digits are given.
2, 3, 4, 5, 6
Find,

a. How many numbers greater than 4000 can be formed out of the above 5 numbers?
b. How many 5 digit numbers could be even? (8 marks)

c) Consider the following finite state machine. (11 marks)



A

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? (1 mark)

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

Question 04 — 25 marks

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

$$3x + y + z = 3$$
$$2x + 2y + 5z = -1$$
$$x - 3y - 4z = 2$$

(10 marks)

b) The admission fee at a small fair is \$1.50 for children and \$4.00 for adults. On a certain day, 2200 people enter the fair and \$5050 is collected.

i) Write down 2 equations to find how many children and how many adults attended the fair. (4 marks)

ii) Write the above 2 equations in matrix form, $A\underline{x} = b$. (2 marks)

iii) Find the inverse of the coefficient matrix A. (3 marks)

iv) Find how many children and how many adults attended the fair using the inverse matrix. (6 marks)

End of the Paper