Sri Lanka Institute of Information Technology

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

Final Examination
Year 1, Semester I (June Intake) (2017)

IT 1030 – Mathematics for Computing

Duration: 2 Hours

October 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 NOR gates, draw the circuits to obtain these outputs.

i. $x + y$

ii. $x \,.\, y$ (8 marks)

b) Prove both variants of absorption law. (10 marks)

c) Convert the following numbers to Decimal.

i. 10111_2

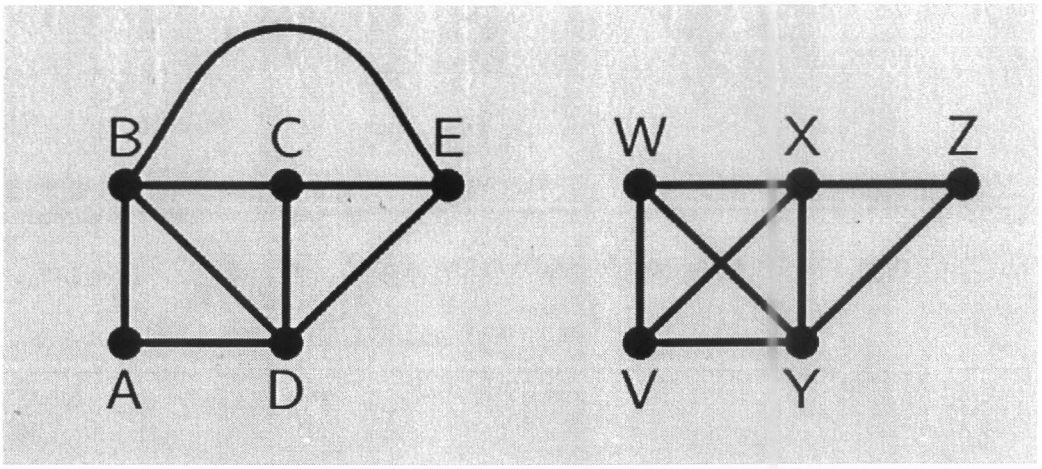
ii. 457_8 (7 marks)

Question 02 — 25 marks

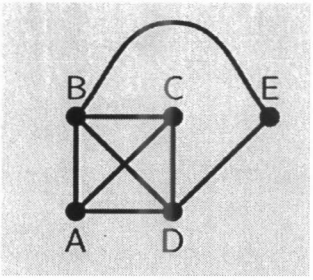
a) Show that the following function is one-to-one. (8 marks)

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

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, 2, 1, 1. If a graph cannot be drawn give reasons. If it can be drawn, state the reasons. (5 marks)

Question 03 — 25 marks

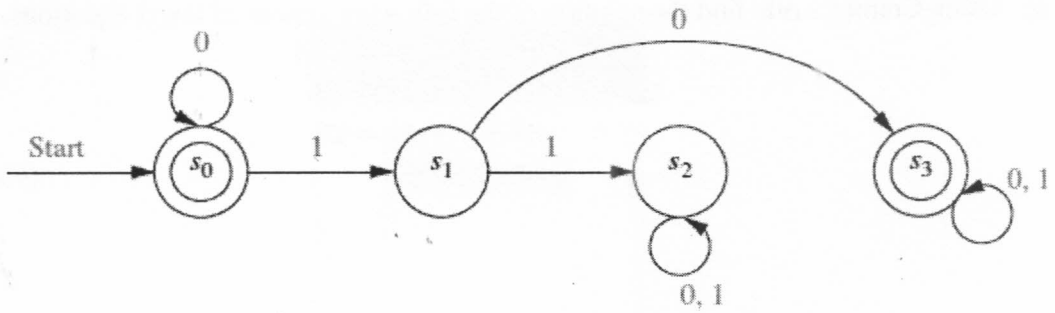
a) Evaluate the following definite integral $\int_0^1 (x^3 - 2) + |x - 2|\, dx$. (6 marks)

b)

i) Six points are marked on a straight line and five points are marked on another line which is parallel to the first line. How many straight lines, including the first two, can be formed with these points? (4 marks)

ii) A selection is to be made for one post of principal and two posts of vice-principal amongst the six candidates called for the interview only two are eligible for the post of principal while they all are eligible for the post of vice-principal. Find the number of possible combinations of selectees. (4 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.

$$4x + 5y - 2z = -14$$
$$7x - y + 2z = 42$$
$$3x + y + 4z = 28$$

(6 marks)

b) Consider the following linear system of equations.

$$5x - 2y + z = -3$$
$$7y - 3z = -4$$
$$4y + 3z = 26$$

i) Write down the augmented matrix for the above system of linear equations.

(2 marks)

ii) Reduce the augmented matrix into its echolen form. (10 marks)

iii) Using the answer in (ii), solve the above linear system of equations.
(7 marks)

End of the Paper