Sri Lanka Institute of Information Technology

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

Final Examination
Year 1, Semester I – June Intake (2019)

IT 1030 – Mathematics for Computing

Duration: 2 Hours

October, 2019

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) Consider the following 2 equations.

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

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

ii) Find the inverse of the coefficient matrix A. (5 marks)

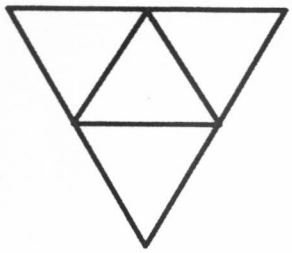
iii) Using answer in (ii) find the values of x and y.

(5 marks)

b) In how many ways can this diagram be colored subject to the following two conditions?

(i) Each of the smaller triangle is to be painted with one of three colors: red, blue or green.

(ii) No two adjacent regions have the same color. (6 marks)



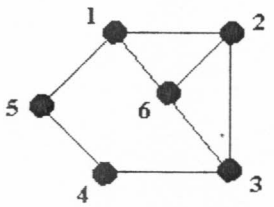
c) Find the coefficient of x^6 in $(x^2 + 3)^3$ (7 marks)

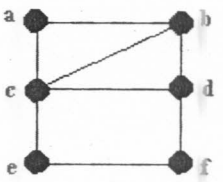
Question 02 — 25 marks

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

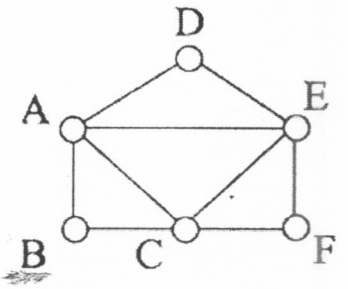
$$f: R \to R \qquad f(x) = \frac{2x+5}{3}$$

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, Hamilton path, Euler circuit and Euler path. Write down the answer in the following table. If it does not exist give reasons. (8 marks)



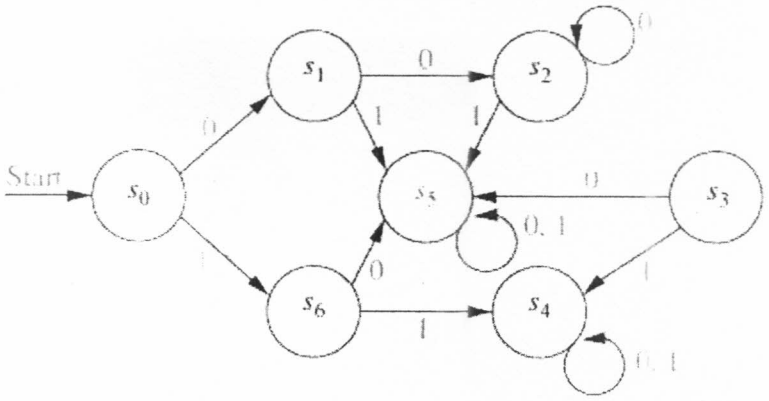
Hamilton circuit	
Hamilton path	
Euler circuit	
Euler path	

d) Draw a graph for the degree sequence 1, 1, 2, 3, 3. If it is not possible give reasons. (5 marks)

Question 03 — 25 marks

a) Evaluate the following definite integral $\int_0^1 (|x-3| + 2x - x^2)\, dx$. (8 marks)

b) Consider the following finite state machine (A). (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) Draw the annotated next-state table for the above finite-state machine A. (5 marks)

c) Given that total indegree of a directed graph is 12. (5 marks)

i) Determine the total outdegree of the graph.

ii) How many edges are in the above graph?

Question 04 — 25 marks

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

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

(10 marks)

b)

i) Find the inverse of the following matrix using the Gaussian method.

$$A = \begin{bmatrix} 1 & 2 & -1 \\ 0 & 1 & -2 \\ -1 & -2 & 2 \end{bmatrix}$$

ii) Find the solution of the following linear system of equations using the answer in (b).

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

End of the Paper