Ministry of Higher Education and Scientific Research
University of Technology
Computer Science Department & Information System
First Class
Info.Sys. , Security, software, Artifical Intelligence)

Time : 3 hours
Date : 9 - 6 - 2009
Subject : Discrete Mathematical Structures
Examiner : MSc. Mohammed Gheni A.

Final Exam- First Trail 2008 – 2009

// Note: Answer all questions //

Q1 : Consider the following deterministic finite state automaton (DFSA) with state transition table shown bellow:

1- Draw the state diagram of DFSA .
2- Explain the component of DFSA .
3- What are the conditions of DFSA .
4- Determine the output state function by arrow. w = 1(101)*1(1001)*(0+1)1

State transition table									
Input Symbols (w)	Next State Function								
	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9
0	-	S_4	S_1	S_5	S_6	-	S_3	-	-
1	S_2	S_3	S_4	S_7	S_9	S_4	S_8	S_9	-

(14 marks)

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Q2 : (Chose two only)

A- Prove the statement is true by using mathematical induction :
$P(n)$: $a + ar + ar^2 + \ldots + ar^{n-1} = a(1 - r^n) / 1 - r$. where $r \neq 1$ (7 marks)

B- 1. A computer must hire 25 programmers to handle systems programming task and 40 programmers for applications programming of those hired, 10 will be expected to perform tasks of each type. How many programmers must be hired.
2. Given (2x -3, 3y -1) = (5, 5) . Find x and y. (7 marks)

C- Sketch the graph of function: $f(x) = x^3 - 3x + 2$ (7 marks)

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Q3 : A- Consider the algebraic expression : $(4a + b/3) / (5 - 2ab)^3$
1- Draw the corresponding to ORT .
2- Rewrite the expression into prefix and postfix polish notation form.
(7 marks)

B- Let $V=\{V_1, V_2, V_3, V_4, V_5, V_6\}$, $E=\{e_1, e_2, e_3, e_4, e_5, e_6, e_7, e_8, e_9\}$.
where $E=\{(V_1, V_2), (V_2, V_3), (V_3, V_6), (V_6, V5), (V5, V_4), (V_4, V_1), (V_1, V_5), (V_5, V_3), (V_5, V_2)\}$
E ={ (1), (3), (1), (4), (6), (3), (2), (4), (2) }
1- Draw the graph.
2- Find the sequence of graph(in part one) according to :
Trail , path , walk and not that
3- Find the minimum path of graph(in part one) between V_1 and V_6 .
(7 marks)

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Q4 : A- Find all partition of x={ a, b, c, d }.
Note : first that each partition of x contains either 1, 2, 3, or 4 distinct sets.
(7 marks)

B- Compute: let A={ a, b, c, d} B={ d, e, f } C={ g, h } U={ a, b, c, d, e, f, g, h }
1- A – B 2- $|A \cap B \cap C|$ 3- A^c 4- $A \cup B \cap C$. (7 marks)

Q5 : (Chose two only)

A- Let $X=\{1, 2, 3, 4\}$, R a relation on X, $a\ R\ b \leftrightarrow a \neq b$, $\forall\ a, b \in X$, Find :

1- R in ordered pairs.
2- R by coordinate.
3- R^{-1} by matrix form.
4- R^{C} by graph form.
5- $R\,o\,(R\ o\ R^{-1})$

(7 marks)

B- Let $Z=\{1, 2, 3\}$, for all part (R is a relation), determine which from this properties of relation :
(reflexive, symmetric, transitive, irreflexive, antisymmetric and equivalence relation)

1- If $R=\{(1, 1), (1, 2), (1, 3), (2, 2), (2, 1), (2, 3), (3, 3), (3, 1), (3, 2)\}$
2- If $R=\{(1, 1), (2, 2), (3, 3)\}$
3- If $R=\{(1, 2), (2, 1), (1, 3), (2, 3), (3, 1)\}$
4- If $(2, 2) \notin R$, $2 \in A$, then $R=\{(2, 1), (2, 3), (3, 3)\}$
5- If $R=\{(1, 2), (2, 3), (1, 3)\}$
6- If $R=\{(1, 2), (2, 1)\}$

(7 marks)

C- Define the following with example : (Chose six only)
Bipartite graph , Incidence matrix , Tree , FSM, Corollary , Subset , Universal set.

(7 marks)

Good luck