Code No. 2359 / N

FACULTY OF INFORMATICS

B.E. 3/4 (IT) I-Semester (New)(Main) Examination, November / December 2012

Subject: Theory of Automata

Time : 3 Hours **Max. Marks: 75**

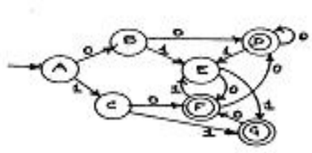
Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1. Draw the transition diagram for the DFA with the following transition table : (3)

δ	0	1
$\rightarrow q_o$	q_2	q_1
$* q_1$	q_1	q_1
q_2	q_2	q_1

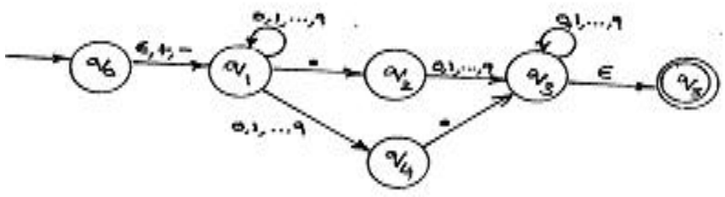
   and give the language of the DFA.
2. Establish and list the equivalent states for the automaton shown below: (3)



3. Give an example to show that the complement of a regular language is not regular. (3)
4. When is a context Free Language said to be inherently ambiguous? How do you remove ambiguity from grammars? (2)
5. Define PDA and Language accepted by PDA by empty stack. (2)
6. Eliminate Useless symbols for the case given below: (3)
   $S \rightarrow aAa / a BC$, $A \rightarrow aS/bD$, $B \rightarrow aBa /b$, $C \rightarrow abb / DD$, $D \rightarrow aDa$
7. When does a Turing Machine Halt? (2)
8. State four undecidable problems about TM specifications. (2)
9. Give two example NP-complete problems. (2)
10. Explain Intractability with a suitable example. (3)

PART – B (5x10=50 Marks)

11.(a) Define Epsilon-closure of a state and explain with a suitable example. (3)
   (b) Convert the Є-NFA given below to an equivalent DFA by eliminating Є-transitions. (7)



12.(a) State and prove pumping Lemma for Regular Languages. (5)
   (b) Design a DFA to accept the language given below: (5)
   L={w/w is of even length and beings with Os}

13.(a) Explain Recursive inference by applying the production of a CFG to infer that certain strings are in the language. (5)
   (b) Define context-free Grammar and Chomsky Normal Form. Find a grammar equivalent to
   $S \rightarrow AB/AC$, $A \rightarrow aA|bAa|a$, $B \rightarrow bbA|aB|AB$, $C \rightarrow aCa|aD$, $D \rightarrow aD|bC$
   with no useless symbols. (5)

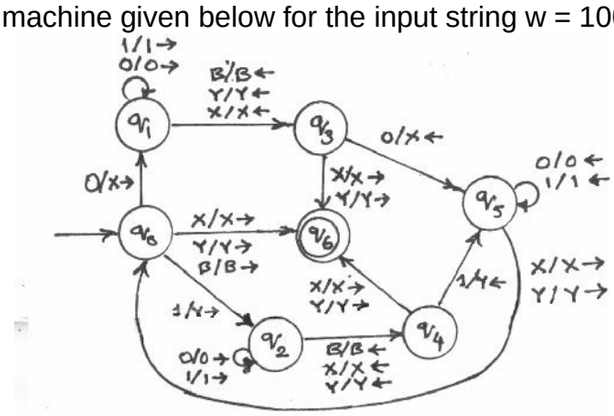
14.(a) For the PDA P=({q_0, q_1, q_2, q_3}, {0, 1}, {X, Y, Z}, δ, q_0, z, {q_3}) with δ defined as:

1. $\delta(q_0, \in, Z) = \{(q_1, XZ)\}$
2. $\delta(q_1, O, X) = \{(q_1, YX)\}$
3. $\delta(q_1, O, Y) = \{(q_1, YY)\}$
4. $\delta(q_1, 1, Y) = \{(q_2, \gamma)\}$
5. $\delta(q_2, 1, Y) = \{(q_2, \gamma)\}$
6. $\delta(q_2, O, Y) = \{q_2, \in\}$
7. $\delta(q_2, \in, X) = \{q_2, \in\}$
8. $\delta(q_1, \in, Z) = \{q_3, Z\}$
9. $\delta(q_2, \in, Z) = \{q_3, Z\}$

Show that the sequence of IDs to demonstrate the processing of the strings given below to reach final state: (7)
(i) 0110 (ii) 00100

(b) What are the two things that are decidable about CFL? Express the complexity of the tests for decidability stated above. (3)

15.(a) Show the sequence of moves in terms of IDs along with the details of state and tape contents at various instants before and after the moves of the Turing machine given below for the input string w = 1001. (7)



(b) Explain the significance of halting of Turing machine. (3)

16.(a) Explain Reduction and show that a language that is not recursive is undecidable. (5)

(b) What is an NP-complete problem? Explain using Traveling salesman problem. (5)

17.(a) Given the MPCP instance shown below, construct PCP instance. (6)

	List A	List B
i	**Wi**	**xi**
1	110	110110
2	0011	00
3	0110	110

(b) Explain the satisfiability problem. (4)

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