DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY

B.TECH. SEMESTER V [Information Technology]

SUBJECT: (IT 511) Theory of Automata and Formal Language

Examination	**: First Sessional**	**Seat No.**	**:**
Date	**: 31/07/2017**	**Day**	**:Monday**
Time	**: 11:30 to 12:45 pm**	**Max. Marks**	**: 36**

INSTRUCTIONS:	
1.	Figures to the right indicate maximum marks for that question.
2.	The symbols used carry their usual meanings.
3.	Assume suitable data, if required & mention them clearly.
4.	Draw neat sketches wherever necessary.
5.	"^" and "ε" indicates null symbol.

Q.1 Do as directed.

(a) Given the language L = {ab, aa, baa}, which of the following strings are in L*? **[02]**

1) abaabaaabaa 2) baaaaabaaaab

i)only 1 ii) only 2 iii) both 1 and 2 iv) neither 1 or 2

(b) 1) From following which are describing Transition function of DFA and NFA- ε. **[01+01]**

i) $Q * \Sigma \rightarrow Q$ ii) $Q * Q \rightarrow \Sigma$ iii) $Q * \Sigma \rightarrow 2^Q$ iv) $Q * (\Sigma \cup \{^\}) \rightarrow 2^Q$

2) Which of the following is true?

i) Union of two regular languages is regular language
ii) Intersection of two regular languages is not a regular language
iii) Complement of two regular languages is not a regular language
iv) None of above is true

(c) Give DFA accepting the following language over the alphabet {0,1}- **[04]**

i) { w | w has all the "0" symbols precede all the "1" symbols}
ii) { w | w contains the symbol "1" at least three times}

(d) **[04]**

Consider the NFA in figure 1,on the alphabet {a, b}.
From following strings which strings are accepted / rejected by the automaton? Justify your answer by clearly indicating the state transitions.

i) aab ii) baa

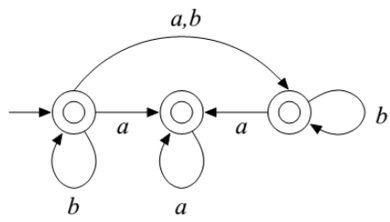

Figure 1

Q.2 Attempt Any Two of following questions.

(a) Minimize the Finite Automata given in figure2. (clearly show the table used) **[06]**

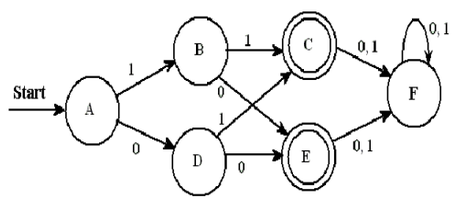

Figure-2

(b) Give a recursive definition for Language having more b's then a's. Consider alphabet of language is {a,b} . Also prove the correctness of your definition using mathematical induction. **[06]**

(c) Prove that: for every alphabet ∑ , every regular language over ∑ can be accepted by a finite automaton (Keene's Theorem, Part1) **[06]**

Q.3 (a) Consider the NFA- ε given in figure3. The start state is 'p' and acceptance state is 'r'.

i) Give the closure set of all states. **[03]**
ii) Find the corresponding DFA (use subset construction technique) **[06]**

	ϵ	a	b	c
$\rightarrow p$	$\emptyset$	$\{p\}$	$\{q\}$	$\{r\}$
q	$\{p\}$	$\{q\}$	$\{r\}$	$\emptyset$
$*r$	$\{q\}$	$\{r\}$	$\emptyset$	$\{p\}$

Figure-3

(b) Give a NFA ε for the language described by regular expression- (01+10)* **[03]**

OR

Q.3 (a) Consider the non-deterministic finite automaton (NFA) over the alphabet Σ = {0, 1} as shown in figure 4. Give Regular expression for the corresponding language, using state elimination technique. **[06]**

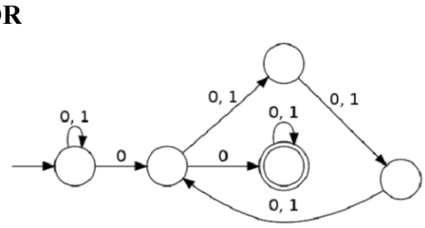

Figure 4

(b) Find the equivalent DFA of the NFA given in figure5. Note:- p is the initial state and r is the accepting state. **[06]**

state	input 0	input 1
p	$\{p, s\}$	$\{q\}$
q	$\{r, s\}$	$\{q\}$
r	$\{r\}$	$\{s\}$
s	$\{\}$	$\{q\}$

Figure 5