Registration No : | | | | | | | | | | |

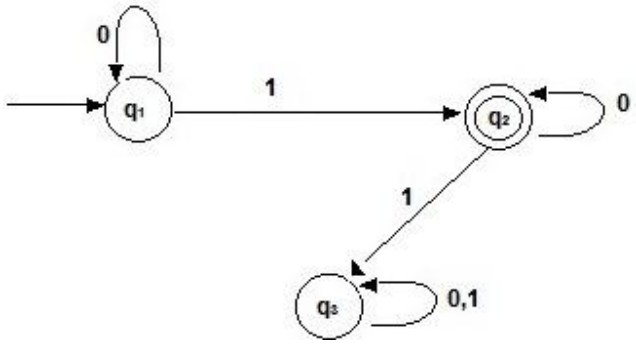
Total Number of Pages : 02 **M.Tech**
CSPE107

1st Semester Back Examination 2019-20
FORMAL LANGUAGE AND AUTOMATA THEORY
BRANCH : COMPUTER ENGG, COMPUTER SCIENCE, COMPUTER SCIENCE AND ENGG, COMPUTER SCIENCE AND TECH.
Time : 3 Hours
Max Marks : 70
Q.CODE : HB864
Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) What is Finite State Machine?
b) Design an NFA which accepts set of all strings with two consecutive zero's.
c) What is the difference between DFA and PDA?
d) What do you mean by a decidable problem?
e) Define NFA mathematically. Design an NFA intuitively which accepts set of all strings containing 3rd symbol from right side is 1.
f) Discuss the Chomsky's Hierarchy of Grammars with examples.
g) State Church-Turing hypothesis.
h) Define TM with its tuple specifications
i) What is a Context Sensitive Grammar? Define in brief with an example.
j) Define non-deterministic PDA.

Q2 **a)** Derive the regular expression for the given DFA **(5)**



b) Construct the PDA for the following grammar **(5)**
S->aA
A->aABD|bB|a
B->b
D->d

Q3 **a)** Discuss the importance of pumping lemma with an example. **(5)**
b) Reduce the following grammar into CNF **(5)**
S→ aAD
A→ aB | bAB
B → b
D → d

Q4 Explain in detail with an example the conversion of NFA to minimized DFA for the by constructing NFA for the regular expression $(a|b)^*baa$. **(10)**

Q5 **a)** Compute the Godel number for the following sequence: **(5)**
i. 1,2,0,1,1,0 ii. 4,3,0,0,1 iii. 2,0,3,1,2 iv. 2,1,1,0

b) What is an Ackerman's function? By defining the Ackerman's function find out the values of **(5)**
i. A (2,3) ii. A (2,2)

Q6 **a)** Design a PDA to accept $L=\{w|w (a,b)^*\}$ such that **(5)**
i. $n_a (w) > n_b(w)$
ii. $n_a (w) < n_b(w)$
Where $n_a (w)$ and $n_b(w)$ represent number of a's and number of b's respectively.

b) Construct a context free grammar to generate the set of all balanced parentheses over the alphabet $\sum = \{(,)\}$ and then design the PDA accepting L of this CFG by empty stack. **(5)**

Q7 **a)** Construct a Turing Machine over alphabet {0,1} that contains set of strings of 0's and 1's except those containing the substring 001. **(5)**

b) Design a TM to accept the language $L(M)=\{a^n b^n c^n | n>=1\}$ **(5)**

Q8 **Write short Notes on any TWO :** **(5 x 2)**

a) Complexity class P vs NP
b) CYK Algorithm
c) Post's Correspondence problem
d) Pumping lemma for regular language