

M. Sc. DEGREE EXAMINATION, APRIL 2017
INFORMATION TECHNOLOGY
SECOND SEMESTER

COURSE : CORE
PAPER : FORMAL LANGUAGES AND FINITE AUTOMATA
TIME : 3 HOURS MAX. MARKS: 100

Section-A

Answer ALL the questions:

10 x 2 = 20

1. Construct a finite automata that accepts $\{0, 1\}^+$.
2. What is the difference between DFA and NFA?
3. Give an example for a regular set.
4. Define closure of a language.
5. Define a context-free language.
6. Write the grammar for Palindrome.
7. Write the steps involved during one transition of a pushdown automata.
8. Define PDA.
9. List the use of Character classes.
10. What is lexical analyzer?

Section-B

Answer any SIX of the following:

6 x 5 = 30

11. Construct a finite state automata that accepts those strings over $\{a,b\}$ that contain aaa as substring.
12. Convert the regular expression $(ab+aba)^*$ to a NFA.
13. Discuss precedence of regular expression operators.
14. What is the strategy for constructing a regular expression from a finite automaton?
15. Show that $(a^101+b^1)^* (a^1+b)$ is in the language defined by the following productions.

1. $E \rightarrow I$
2. $E \rightarrow E + E$
3. $E \rightarrow E * E$
4. $E \rightarrow (E)$

5. $I \rightarrow a$
6. $I \rightarrow b$
7. $I \rightarrow Ia$
8. $I \rightarrow Ib$
9. $I \rightarrow I0$
10. $I \rightarrow I1$

16. Explain the components of transition diagram of PDA with an example.
17. What are the three principles about ID's and their transitions in PDA's?
18. Design an NFA to recognize occurrences of the words web and ebay.

Section-C

Answer any FIVE of the following:

5 x 10 = 50

19. (a) Find DFA and regular expression. DFA accepts all strings corresponding to the expression $1^* 01 (0+11)^*$.
 (b) Explain how to convert DFA to regular expression by eliminating states.
20. State and prove the pumping lemma for regular languages.
21. Prove that the grammar

$$G_{pat} = (\{P\}, \{0, 1\}, A, P)$$

Where A represents the following production

1. $P \rightarrow \epsilon$
2. $P \rightarrow 0$
3. $P \rightarrow 1$
4. $P \rightarrow 0P0$
5. $P \rightarrow 1P1$

is the set of palindromes over $\{0,1\}$.

22. Discuss the graphical notation of Deterministic Pushdown Automata with a suitable example.
23. Construct the transition diagram for a Turing Machine that accepts strings of the form $0^n 1^n$.
24. Explain in detail any two applications of Finite Automata with examples.
25. What is the general technique for converting a CFG with regular expressions as production bodies to an ordinary CFG. Explain with an example.
