US – 644

VI Semester B.C.A. Examination, May 2017
(2016 – 17 & Onwards) (CBCS)
COMPUTER SCIENCE
BCA 601 : Theory of Computation

Time : 3 Hours

Max. Marks : 100

***Instruction** : Answer **all** Sections.*

SECTION – A

Answer **any ten** questions. **Each** question carries **two** marks. **(10×2=20)**

1. Define Finite Automata.
2. Define DFA. Mention the types of Finite Automata.
3. Build an regular expression that generates a string with even number of 0's followed by odd number of 1's.
4. What is Pumping Lemma ?
5. What are terminal and non-terminal symbols in grammar ?
6. What is left most derivation in CFG ?
7. What are the different types of grammar ?
8. Mention the 7 types of PDA.
9. Define GNF.
10. What are useful and useless symbols in grammar ?
11. What is Turing Machine ?
12. What are the different types of Turing Machine ?

SECTION – B

Answer **any five** questions. **Each** question carries **five** marks. **(5×5=25)**

13. Mention five differences between DFA and NFA.
14. Construct a DFA to accept the string 'abba'.

P.T.O.

15. Explain the various applications of Regular expressions.

16. Obtain the left most and right most derivations for the string 00112. The production rules are given by

$P = \{S \rightarrow AB$

$A \rightarrow 01 \mid 0A1$

$B \rightarrow \in \mid 2B$

17. Prove that $S \rightarrow aSbS/bSaS/\in$ is ambiguous.

18. Write a short note on Chomsky hierarchy of languages.

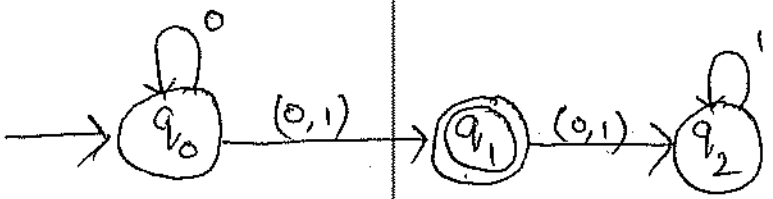
19. Write down the steps for conversion of DFA to CFG.

20. Explain halting problem of Turing Machine.

SECTION – C

Answer **any three** questions. **Each** question carries **fifteen** marks. **(15x3=45)**

21. Convert the following NFA to its equivalent DFA.



22. Construct a NFA with $\in$ for $(0 + 1)^* 1 (0 + 1)$.

23. Explain the block diagram of Pushdown automata with its components, specification, language and transition table.

24. Transform the CFG into GNF

$S \rightarrow AB$

$A \rightarrow BS \mid 1$

$B \rightarrow SA \mid 0$

25. a) Explain Post's Correspondence Problem (PCP). **8**

b) Explain intersection and homomorphism property of Regular languages. **7**

SECTION – D

Answer **any one** question.

26. Find the minimized DFA for the following transition table : **10**

	δ	a	b
→	A	B	A
	B	A	C
	C	D	B
	*D	D	A
	E	D	F
	F	G	E
	G	F	G
	H	G	D

27. Design a Turing Machine that accepts the language of all strings over the alphabet $\sum = \{a, b\}$ whose second letter is 'b'. **10**