

M.Sc. (Part—II) Semester—III (CBCS) Examination
3MCS4 (2) : COMPUTER SCIENCE
(Theory of Computation)

Time : Three Hours]

[Maximum Marks : 80

- N.B. :—** (1) All questions are compulsory.
 (2) Assume suitable data wherever necessary.
 (3) Illustrate your answer with the help of neat sketches.

1. (A) What is NFA ? Explain with example. 5
 (B) Explain :
 (i) Trees
 (ii) Regular expressions. 8

OR

2. (A) Convert NFA to its equilater DFA :
 ($\{p, q, r, s\}, \{0, 1\}, \delta, p, \{s\}$)

δ	0	1
p	q, s	q
q	r	q, r
r	s	p
s	—	p

7

- (B) Write regular expression for following languages :
 (i) Set of all strings containing 101 as substring.
 (ii) Set of all strings ended with 11.
 (iii) Set of all strings starting with 00. 6
3. (A) What is two way Finite Automata ? Explain. 7
 (B) State and explain the pumping lemma for regular sets. 6

OR

4. (A) Prove that regular sets are closed under intersection. 7
 (B) State and explain applications of Finite Automata. 6
5. (A) What is CFG ? Explain. 7
 (B) What is Push Down Automata ? Explain. 6

OR

6. (A) What is GNF ? Explain. 6
 (B) Find CFG with no useless symbols equivalent to :
 $S \rightarrow AB \mid CA$
 $B \rightarrow BC \mid AB$
 $A \rightarrow a$
 $C \rightarrow aB \mid b$ 7

7. (A) Design Turing machine to recognize the following language :
 $\{0^n 1^n 0^n \mid n \geq 1\}$. 8
(B) State and explain Church's hypothesis. 7
- OR**
8. (A) Design Turing machine to recognize the following language :
 $\{wW^R \mid w \text{ is in } (0 + 1)^*\}$ 8
(B) State and explain modifications in Turing machine. 7
9. (A) What is unrestricted grammar ? Explain. 6
(B) Construct Left linear and Right linear grammar for the language :
 $(0 + 1)^* 00 (0 + 1)^*$ 7
- OR**
10. (A) What are context sensitive languages ? Explain. 6
(B) Construct Left linear and Right linear grammar for the language :
 $0^*(1(1 + 0))^*$ 7
11. (A) What is universal languages ? Explain. 7
(B) What is PCP ? Explain. 6
- OR**
12. (A) What are the applications of PCP ? Explain. 7
(B) What are the properties of recursive and non-recursive enumerable languages ? Explain. 6