## 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.

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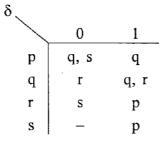
- (B) Explain:
  - (i) Trees
  - (ii) Regular expressions.

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OR

2. (A) Convert NFA to its equilater DFA:

$$({p, q, r, s}, {0, 1}, \delta, p, {s})$$



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- (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.
- 3. (A) What is two way Finite Automata? Explain.
  - (B) State and explain the pumping lemma for regular sets.

OR

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

OR

- 6. (A) What is GNF? Explain.
  - (B) Find CFG with no useless symbols equivalent to:

 $S \rightarrow AB \mid CA$ 

 $B \rightarrow BC \mid AB$ 

 $A \rightarrow a$ 

 $C \rightarrow aB \mid b$ 

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7. (A) Design Turing machine to recognize the following language:

$$\{0^n1^n0^n \mid n \ge 1\}.$$

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(B) State and explain Church's hypothesis.

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OR

8. (A) Design Turing machine to recognize the following language:

$$\{wW^{R} | w \text{ is in } (0 + 1)^*\}$$

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(B) State and explain modifications in Turing machine.

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9. (A) What is unrestricted grammar? Explain.

6

(B) Construct Left linear and Right linear grammar for the language:

$$(0+1)^*$$
 00  $(0+1)^*$ 

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OR

10. (A) What are context sensitive languages? Explain.

6

(B) Construct Left linear and Right linear grammar for the language:

$$0*(1(1 \pm 0))*$$

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11. (A) What is universal languages? Explain.

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(B) What is PCP? Explair.

6

OR

12. (A) What are the applications of PCP? Explain.

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(B) What are the properties of recursive and non-recursive enumerable languages? Explain.

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