



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech V SEMESTER END EXAMINATIONS (REGULAR/ SUPPLEMENTARY) - FEBRUARY 2024

Regulation: UG20

THEORY OF COMPUTATION

Time: 3 Hours

(COMMON TO CSE(CS) | CSE(DS))

Max Marks: 70

Answer ALL questions in Module I and II

Answer ONE out of two questions in Modules III, IV and V

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

- (a) Explain the fundamental differences between Moore and Mealy machines in terms of how they generate outputs based on inputs and states? [BL: Understand| CO: 1|Marks: 7]
- (b) Convert the given NFA with epsilon to DFA for the following state diagram shown in Figure 1 [BL: Apply| CO: 1|Marks: 7]

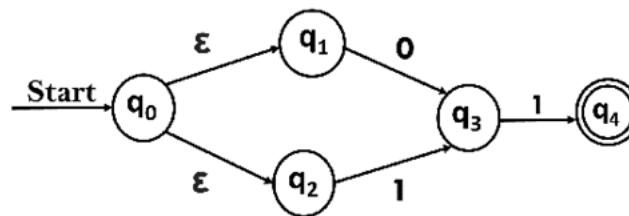


Figure 1

MODULE – II

- (a) Obtain the left and right derivation for a string $w=001122$ for the production rules $S \rightarrow AB$, $A \rightarrow 01|0A1$, $B \rightarrow 2B|\epsilon$. [BL: Apply| CO: 2|Marks: 7]
- (b) Design a regular expression for the language containing odd number of 0's or an odd number of 1's in the strings. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

- (a) For the grammar G defined by the productions:
 $S \rightarrow AB|BA|A|B$
 $A \rightarrow 0A|\epsilon$
Design the parse tree for yields i) 1001 ii) 00101 [BL: Apply| CO: 3|Marks: 7]
- (b) Show that the following grammar is ambiguous.
 $S \rightarrow a / abSb / aAb$
 $A \rightarrow bS / aAab$ [BL: Apply| CO: 3|Marks: 7]

4. (a) Eliminate ϵ productions from the grammar CFG
 $S \rightarrow XYX$
 $X \rightarrow 0X \mid \epsilon$
 $Y \rightarrow 1Y \mid \epsilon$ [BL: Apply| CO: 4|Marks: 7]
- (b) Use the pumping lemma to prove that the language $A = \{ 0^{2n} 1^{3n} 0^n \mid n \geq 0 \}$ is not context free.
 [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) How pushdown automata (PDA) perform acceptance of context free languages? Explain the block diagram of PDA with its components. [BL: Understand| CO: 5|Marks: 7]
- (b) Convert the given context free grammar to equivalent pushdown automata:
 $S \rightarrow a \mid aS \mid bSS \mid SSb \mid SbS$ [BL: Apply| CO: 5|Marks: 7].
6. (a) Describe deterministic context free languages (CFL) and deterministic push down automata. Compare deterministic CFL and PDA. [BL: Understand| CO: 5|Marks: 7]
- (b) Find the PDA equivalent to the given CFG with the following productions
 $S \rightarrow A, A \rightarrow BC, B \rightarrow ba, C \rightarrow ac$ [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) What is a recursive and recursively enumerable language? Differentiate between PDA and TM. [BL: Understand| CO: 6|Marks: 7]
- (b) Summarize the following terms
 i) Two-way infinite tape TM
 ii) Multiple tracks TM [BL: Understand| CO: 6|Marks: 7]
8. (a) Explain the architecture of linear bounded automata. Write the properties of linear bounded automaton. [BL: Understand| CO: 6|Marks: 7]
- (b) Construct a turing machine that accepts the language $L = \{ 1^n 2^n 3^n \mid n \geq 1 \}$. Give the transition diagram for the turing machine obtained and also show the moves made by the turing machine for the string 111222333. [BL: Apply| CO: 6|Marks: 7]

