Hall Ticket No | | | | | | | | | | | Question Paper Code: AITB03

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Regular/Supplementary) - July, 2021

Regulation: R18

THEORY OF COMPUTATION

Time: 3 Hours **(CSE|IT)** **Max Marks: 70**

Answer FIVE Questions choosing ONE question from each module
(NOTE: Provision is given to answer TWO questions from any ONE module)
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Construct NFA with epsilon for the regular expression = $(a|b)^*abb$ and convert into DFA and further find the minimized DFA. **[7M]**

   (b) Consider the following NFA- ϵ for an identifier. Consider the ϵ-closure shown in Figure 1 of each state and find its equivalent DFA. **[7M]**

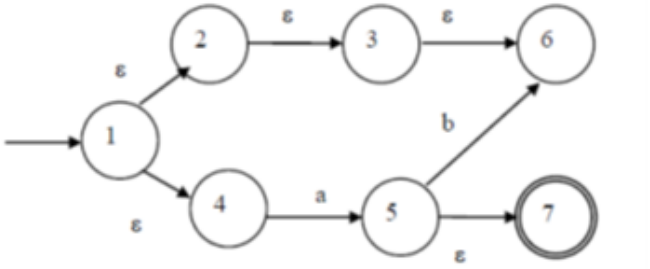

Figure 1

2. (a) Convert the following NFA to DFA shown in Table 1. **[7M]**

Table 1

States	Inputs	
	0	1
$\rightarrow p$	{p,q}	{p}
q	{r}	{r}
r	{s}	ϕ
s	{s}	{s}

   (b) Design a NFA that accepts the following strings over the alphabet {0, 1}. The set of all strings that begins with 01 and ends with 00. Check for the validity of 011100 and 01100 strings and find its equivalent DFA. **[7M]**

MODULE – II

3. (a) Write in detail about closure properties of regular languages **[7M]**

   (b) Find the regular expression for the following automata shown in Figure 2 **[7M]**

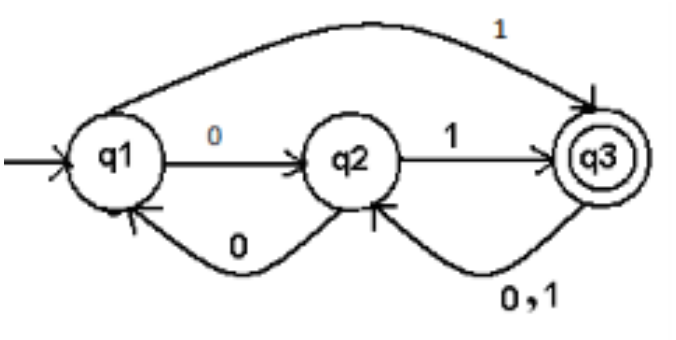

Figure 2

4. (a) Construct a minimized finite automata for the regular rxpression $(a(a+b)^*a)$ **[7M]**

   (b) Prove that the following languages are not regular. **[7M]**

$$L = \{w\,\epsilon\{a,b\}|w = w^R\}$$

$$L = \{0^n\ 1^{2n}|n \geq 1\}$$

MODULE – III

5. (a) Given the grammar $G = (V, \sum, R, E)$ where

$$V = \{E, D, a, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, +, -, /, (,)\}$$

$$\sum = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 0, +, -, /, (,)\}$$

R contains the following rules

$$E \to D|(E)|E + E|E - E|E * E|E/E$$

$$D \to 0|1|2|3|....9$$

Find a parse tree for the string $1 + 2 * 3$. **[7M]**

   (b) Let G be the grammar with

$$S \to aB|bA$$

$$A \to a|aS|bAA$$

$$B \to b|bS|aBB$$

for the string *aaabbabbba* find the leftmost derivation and rightmost derivation. **[7M]**

6. (a) Construct the following grammar in CNF. **[7M]**

$$S \to abSba|bAaB|bb$$

$$A \to aa|aSAb$$

$$B \to Aa|abb$$

(b) Convert the following grammar G into Greibach normal form (GNF) **[7M]**

$$S \rightarrow AB$$

$$A \rightarrow BS|b$$

$$B \rightarrow SA|a$$

MODULE – IV

7. (a) Construct a PDA for the CFG given below: **[7M]**

$$S \rightarrow aSbb$$

$$S \rightarrow aab$$

(b) Construct PDA for the language $a^n b^m a^{n+m}$ **[7M]**

8. (a) Show that L(P) is language acceptance by final state and N(P) is language acceptance by empty stack. **[7M]**

(b) Convert PDA to CFG. PDA is given by **[7M]**
$P = (\{p, q\}, \{0, 1\}, \{X, Z\}, \delta, \{q\}, Z)$ where δ is given by,

$$\delta(p, 1, Z) = (p, XZ)$$

$$\delta(p, \epsilon, Z) = \{(p, \epsilon)\}$$

$$\delta(p, 1, X) = (p, XX)$$

$$\delta(q, 1, X) = (q, \epsilon)$$

$$\delta(p, 0, X) = (q, X)$$

$$\delta(q, 0, Z) = (p, Z)$$

MODULE – V

9. (a) Describe the Chomsky hierarchy of languages. **[7M]**

(b) Design a Turing machine to accept the language $L = \{0^n 1^n | n \geq 1\}$. Draw the transition diagram. Also specify the instantaneous description to trace the string 0011. **[7M]**

10. (a) State and describe the halting problem for Turing machine. **[7M]**

(b) Construct a Turing Machine to accept palindrome in an alphabet set $\sum = \{a, b\}$. Trace the string **'ababa'** and **'aab** **[7M]**

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