B.E. Fourth Semester (Computer Science & Engineering, Computer Engineering) (CGS)

10315 : Theory of Computation : 4 KS 05 / 4 KE 05

P. Pages : 3 | **AW - 3046**

Time : Three Hours | Max. Marks : 80

Notes : 1. Answer **three** question from Section A and **three** question from Section B.
2. Assume suitable data wherever necessary.
3. Illustrate your answer necessary with the help of neat sketches.
4. Use of pen Blue/Black ink/refill only for writing the answer book.

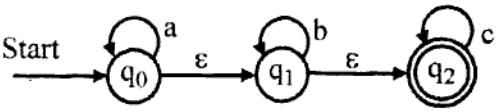
SECTION - A

1. a) Construct a DFA over {0, 1} that accept even number of 0's and odd number of 1's. **7**

b) Design a Melay machine to determine residue mod 3 for each binary string treated as binary integer. **6**

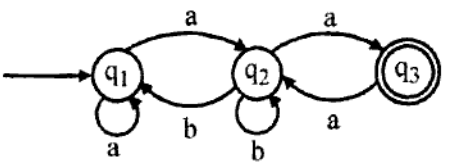
OR

2. a) Convert the NFA with ε-transition to NFA without ε-transition. **7**



b) Construct a DFA to accept the language over {0, 1} to accept a string 1100 or 1010 only. **6**

3. a) Construct a regular expression for the state diagram described by: **7**



b) Describe following sets by regular expressions. **6**
i) Set of all strings of 0's and 1's ending with '00'
ii) Set of all strings of 0's and 1's starting with 0 and ending with '1'.

OR

4. a) Let $G = \{(A_0, A_1), (a, b), P, A_0\}$ where P Consists of **8**

$A_0 \rightarrow a\ A_1$

$A_1 \rightarrow b A_1$

$A_1 \rightarrow a$

$A_1 \rightarrow b A_0$

Construct transition system m for it.

b) Find the left linear and right linear grammar for $(0+1)^* 00(0+1)^*$. **5**

5. a) Design a PDA for the language. 7

$L = \{wcw^R \mid w \varepsilon \{a, b\}^+\}$

b) Let G be the Grammar 7

$S \rightarrow ab / bA$

$A \rightarrow a / aS / bAA$

$B \rightarrow b / bS / aBB$

for the string 'aaabbabbba' find:

i) Left most derivation

ii) Right most derivation

iii) Parse tree

OR

6. a) Design CFG for the language: 8

i) $L(G) = \{a^n b^n \mid n \geq 0\} \cup \{b^n a^n \mid n \geq 0\}$

ii) $L(G) = \{wwR \mid w\varepsilon(a, b)^*\}$

b) Convert the following grammar into CNF. 6

$S \rightarrow abAB$

$A \rightarrow bAB / \lambda$

$B \rightarrow Baa / A / \lambda$

SECTION - B

7. a) Design a Turing Machine to compute the function m+n. 6

b) Explain multidimensional Turing machine. 7

OR

8. a) Design a Turing machine that accepts: 8

$L = \{O^n 1^n \mid n \geq 1\}$

b) Explain in brief Multitape Turing machine. 5

9. a) Explain the following grammars in detail: 7

i) Type - 0

ii) Type - 1

iii) Type - 2

iv) Type - 3

b) Is the language $\{wcw^R \mid w \varepsilon \{a, b\}^*\}$ deterministic? 6

OR

10. a) Find context sensitive grammar for $L = \{a^n b^n c^n \mid n \geq 1\}$ 6

b) Find the grammar generating the set accepted by LBA whose transition table is as follows: 7

Present state	Tape input symbol			
	¢	$	0	1
q_1	¢ Rq_1	-	1L q_2	0R q_2
q_2	¢ R q_4	-	1R q_3	1 Lq_1
q_3	-	\$Lq_1	1Rq_3	1Rq_3
q_4	-	Halt	0Lq_4	0Rq_4

11. a) Determine whether the following pair (A, B) have a solution or not, if yes give a solution, if no why? 8

i) $A = \{b, bab^3, ba\}$, $B = \{b^3, ba, b\}$

ii) $A = \{01, 1, 1\}$, $B = \{01^2, 10^2, 1^2\}$

b) Explain Halting problem. 6

OR

12. a) Show the following functions are recursive. 6

i) n + m

ii) n.m

b) Prove the following 8

i) The complement of a recursive language is recursive.

ii) The union of two recursive language is recursive

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