Reg. No

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester – Regular) Examinations, June – 2021

BPCCS4050 / BPCCT 4050 – FORMAL LANGUAGES AND AUTOMATA THEORY

(Common to CSE and I.T)

Time: 2 hrs   Maximum: 50 Marks

Answer ALL Questions
The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)   **(1 x 10 = 10 Marks)**

Q.1. Answer *ALL* questions   [CO#]   [PO#]

a. In NFA with $\in$, the transition is   1   1

(i) $Q \times \Sigma^* \to 2^Q$ (ii) $Q \times \Sigma \to 2^Q$

(iii) $Q \times \Sigma \cup \{ \in \} \to 2^Q$ (iv) $Q \times \Sigma \to Q$

b. Which of the following is correct statement in FA   1   1

(i) Finite tape length, bi-directional tape movement   (ii) Finite tape length, unidirectional tape movement

(iii) Infinite tape length, unidirectional tape movement.   (iv) Infinite tape length, bi-directional tape movement

c. $\delta (q,xy) =$ 1   2

(i) $\delta(\delta(q,y)x)$ (ii) $\delta(q,yx)$

(iii) $\delta(\delta(q,x),y)$ (iv) $\delta(q,y) \cup \delta(q,x)$

d. Which of the following regular expressions identities are true?   2   1

(i) $(r+s)^* = r^*$ (ii) $(r^*s^*)^* = (r+s)^*$

(iii) $(r+s)^* = r^*+s^*$ (iv) $r^*s^* = r^*+s^*$

e. The reduced grammar of $S \to AB/a$, $A \to a$ is   2   2

(i) $S \to a$ $A \to a$ (ii) $S \to a/A$ $A \to a$

(ii) $S \to a$ (iv) $S \to aa$

f. Which of the following is true?   3   1

(i) PDA accepts all regular, all context free and some non-regular languages.   (ii) PDA accepts some regular, all context free and some non-regular languages.

(iii) PDA accepts all regular, non-context free and some non-regular languages.   (iv) PDA accepts all regular, all context free and all non-regular languages.

g. To get the PDA the CFG should be in the form of   3   1

(i)   CFG   (ii)   GNF

(iii)   RE   (iv)   CNF

h. The mapping $Q \times T \to Q \times T \times (L, R, N)$ is for   4   1

(i)FA   (ii)PDA

(iii)NDPDA   (iv)TM

i. Which of the following statements is incorrect?   4   1

(i) Every recursively enumerable language is recursive.   (ii) Complement of a recursive language is recursive.

(iii) Recursive languages are said to be decidable.   (iv) If L is a recursive language, then TM halts for $w \in L$ and rejects $w \notin L$.

j. Let A = set of recursive languages, B= set of recursively enumerable languages. Then   4   1

(i) A is a subset of B.   (ii) B is subset of A.

(iii) A and B are the same set.   (iv) A and B are disjoint sets.

PART – B: (Short Answer Questions)   (2 x 5 = 10 Marks)

Q.2. Answer *ALL* questions   [CO#] [PO#]

a. Design a DFA that accepts the set $\{aa^n / n \geq 1\}$ 1   2

b. Write the minimum length string which is not there in the language generated by 0*1*   1   2

c. Write the regular expression for the set of all strings of 0's and 1's ending with '00'   2   2

d. Write the model of a TM and what are the special features of a TM   4   1

e. Give an example of a language which is accepted by DPDA and describe the language.   3   2

PART – C: (Long Answer Questions)   (6 x 5 = 30 Marks)

Answer *ANY FIVE* questions   Marks   [CO#]   [PO#]

3. Design a DFA for the following Language L=$\{x01y/$ x and y are any string of 0's and 1's$\}$ and check the string '000110'.   (6)   1   2

4. Construct a minimum state automaton equivalent to a given automaton M whose transition table is   (6)   1   2

State	0	1
→Q0	Q1	Q3
Q1	Q2	Q4
Q2	Q1	Q4
Q3	Q4	Q2
*Q4	Q4	Q4

5. Draw a transition diagram of NFA with Є – Transitions for the Regular Expression ab (a + b)* ba .   (6)   2   2

6. Construct CFG's for the language $\{w \in \{0, 1\}^* /$ w starts and ends with same symbol$\}$ (6)   2   2

7. Design a TM to compute one's complement of a given binary number.   (6)   3   2

8. Construct PDA for the following language L = $\{a^m b^{2m} / n \geq 1\}$ (6)   3   2

9. Explain about NP complete and NP Hard problems with examples.   (6)   4   3

10. What is Recursively enumerable language? Explain.   (6)   4   3

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