

B.E. INFORMATION TECHNOLOGY THIRD YEAR FIRST SEMESTER - 2024

AUTOMATA AND COMPILER(HONS.)

Time : 3 hours

Full Marks : 100

CO1(20): A. Give the Regular expressions of the following languages: $L = \{W/W \text{ is a string of even number of 0's followed by odd number of 1's}\}$ (5)

B. Give the Regular expressions of the following languages. $L = \{W/W \text{ is in } \{a,b\}^* \text{ and } |W| \bmod 2 = 0\}$ (5)

C. Prove or disprove the argument "aaabbaaa is regular" (5)

D. Design a FA which accepts all binary strings having an odd number of 0s or even number of 1s. (5)

CO2(20): Answer A and any one from B and C

A. Let M be the PDA defined by

$$Q = \{q_0, q_1, q_2\}$$

$$\Sigma = \{a, b\}$$

$$\Gamma = \{A\}$$

$$F = \{q_1, q_2\}$$

$$\delta(q_0, a, \lambda) = [q_0, A]$$

$$\delta(q_0, \lambda, \lambda) = [q_1, \lambda]$$

$$\delta(q_0, b, A) = [q_2, \lambda]$$

$$\delta(q_1, \lambda, A) = [q_1, \lambda]$$

$$\delta(q_2, b, A) = [q_2, \lambda]$$

$$\delta(q_2, \lambda, A) = [q_2, \lambda]$$

1. Describe the language accepted by M (8)

2. Give the state diagram of M (3)

3. Show that $aabb, aaab \in M$ (4)

B. Construct the equivalent PDA for the following CFG

$$E \rightarrow E+T|T$$

$$T \rightarrow T \times F | F$$

$$F \rightarrow (E) | a$$

Input string $a+axa$ and $axa+a$ (5)

C. Write the tuples and transition function for PDA of following grammar,

$$S \rightarrow aAA$$

$$A \rightarrow aS|bS|a \quad (5)$$

CO3 and CO 4 (35):

A. How many parse trees can be constructed for the given ambiguous grammar?

$E \rightarrow E+E \quad E \rightarrow E * E \quad E \rightarrow id$ Input string: $id + id + id$. (6)

B. Consider the grammar given below:

$$S \rightarrow Aa$$

$$A \rightarrow BD$$

$$B \rightarrow b | \epsilon$$

$$D \rightarrow d | \epsilon$$

Let a, b, d, and \$ be indexed as follows:

| | | | |
|---|---|---|----|
| a | b | d | \$ |
| 3 | 2 | 1 | 0 |

Compute the FOLLOW set of the non-terminal B and write the index values for the symbols in the FOLLOW set in the descending order. (For example, if the FOLLOW set is {a, b, d, \$}, then the answer should be 3210) (4)

C. Consider the following grammar.

$$S \rightarrow aSB \mid d$$
$$B \rightarrow b$$

Compute the number of reduction steps taken by a bottom-up parser while accepting the string aaadbbb. (7)

D. Compute FIRST and FOLLOW sets: $S \rightarrow aAC \mid bB$ $A \rightarrow Abc \mid Abd \mid e$ $B \rightarrow f \mid g$ $C \rightarrow h \mid i$ (5)

E. Consider the context free grammar $S \rightarrow aSb \mid X$, $X \rightarrow aX \mid Xb \mid a \mid b$ (S, X are non terminals and a, b are terminals.) Find out the language L generated by the grammar, (5)

F. Check whether the following grammar is LL(1)

$$S \rightarrow aSbS \mid bSaS \mid \epsilon$$
 (8)

CO5 and CO6 (25): Answer A and B and any one from C and D.

A. Explain the responsibility of semantic analyser for the given code snap.

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float x = 10.1;
```

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float y = x*30; (8)
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B. Describe the 3 address code using an examples.(7)

C. Explain briefly various steps of peephole optimization techniques. (10)

D. Explain briefly various steps of loop optimization techniques. (10)
