

M.Sc. 2nd Semester Examination, 2016

**THEORY OF FORMAL LANGUAGE  
AND AUTOMATA**

**PAPER—COS - 202**

**Full Marks : 40**

**Time : 2 hours**

*The figures in the right-hand margin indicate marks*

*Candidates are required to give their answers in their own words as far as practicable*

*Illustrate the answers wherever necessary*

**GROUP—A**

**Answer any two questions : 10 × 2**

1. (a) Construct a DFA accepting all strings over  $\{a, b\}$  such that the number of  $a$ 's in those strings are divisible by 3 and ending with  $ab$ .

(Type Over)

( 2 )

- (b) Construct a Moore machine equivalent to the Mealy machine defined by the following table :

5

| Present State     | Next State |        |         |        |
|-------------------|------------|--------|---------|--------|
|                   | $a = 0$    |        | $a = 1$ |        |
|                   | State      | Output | State   | Output |
| $\rightarrow q_0$ | $q_2$      | 1      | $q_3$   | 1      |
| $q_1$             | $q_0$      | 0      | $q_2$   | 0      |
| $q_2$             | $q_1$      | 1      | $q_0$   | 1      |
| $q_3$             | $q_3$      | 0      | $q_1$   | 1      |

- (c) Construct a transition system which can accept strings over the alphabet set  $\{a, b, c, \dots, z\}$  containing either *mat* or *sat*.

2

2. (a) Consider the following grammar :

$$S \rightarrow aS \mid bS \mid a \mid b$$

Find the language accepted by the above grammar.

2

(b) Construct a grammar generating the language :

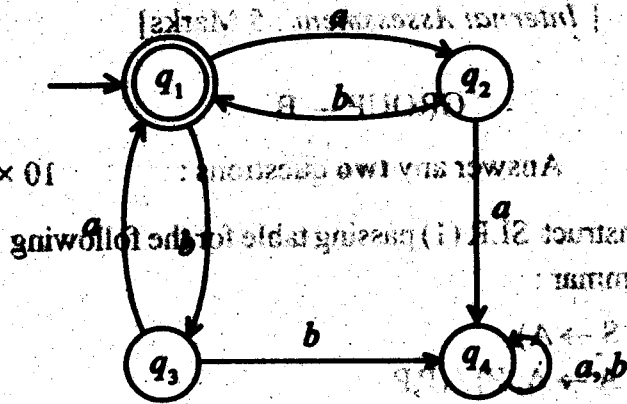
$$\{WCW^T \mid W \in \{a, b\}^*\}.$$

(c) What do you mean by Context Sensitive Language ? Give an example.

3. (a) Find the DFA equivalent to the grammar :

$$S \rightarrow aS \mid bS \mid aA, A \rightarrow bB, B \rightarrow aC, C \rightarrow \text{null}$$

(b) Obtain the regular expression accepted by the finite automation described by the following transition diagram :



( 4 )

(c) Find a reduced grammar equivalent to the grammar :

$$S \rightarrow aAa \mid bD, A \rightarrow bBB, B \rightarrow ab, C \rightarrow aB \quad 3$$

4. (a) Reduce the following grammar to Greibach normal form :

$$S \rightarrow A0, A \rightarrow 0B, B \rightarrow A0 \mid 1 \quad 5$$

(b) Construct a PDA accepting the following language :

$$\{a^n b^{2n} \mid n \geq 1\} \quad 5$$

[ Internal Assessment : 5 Marks ]

### GROUP – B

Answer any two questions :  $10 \times 2$

1. Construct SLR (1) parsing table for the following grammar :

$$S \rightarrow A)$$

$$A \rightarrow A, P) / (P,P$$

$$P \rightarrow \{\text{num}, \text{num}\}$$

10

2. For the following program segment obtain the basic blocks and the DAG representation of basic blocks :

```
begin
  PROD = 0;
  I = 1;
do
  begin
    PROD = PROD * (A[I] + B[I]);
    I = I + 1;
  end
while IC = 10;
end.
```

10

3. Consider the following gr.

$S \rightarrow Aa/Bb/cC$

$C \rightarrow Ab/Ba$

$A \rightarrow D$

$B \rightarrow D$

$D \rightarrow E$

Construct the LL(1) parse table for this grammar.

Is this grammar LL(1) ? Why or why not ?

10

( 6 )

4. (a) Describe various representation of three address codes. Translate the expression

$$-(a + b) * (c + d) + (a + b + c)$$

into quadruples and Triples.

2 + 4

- (b) Consider the following gr.

$$G: E \rightarrow E + T / T$$

$$T \rightarrow T * F / F$$

$$F \rightarrow (E) / id$$

Associate semantic rules with the production for construction of syntax tree for an expression. Using translation scheme construct the syntax tree for the expression  $a + b * c$ .

4

[ *Internal Assessment : 5 Marks* ]

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