

B.TECH.

THEORY EXAMINATION (SEM-IV) 2016-17

THEORY OF AUTOMATA AND FORMAL LANGUAGES

Time : 3 Hours

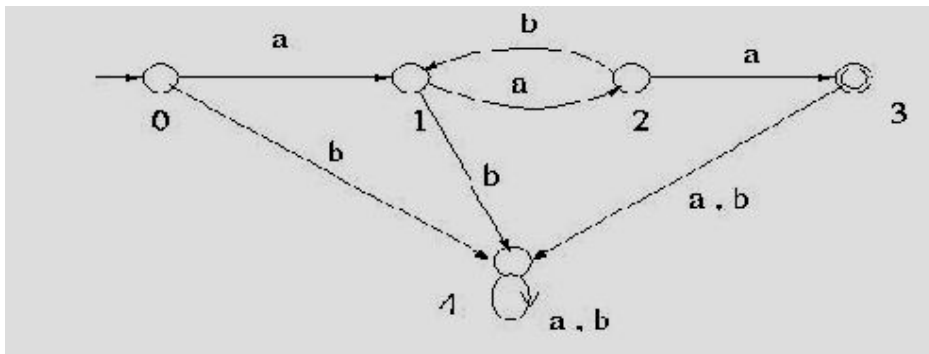
Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

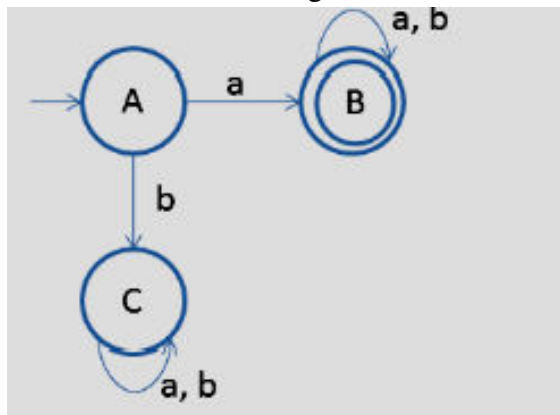
SECTION – A

1. Explain the following: 10 x 2 = 20

- (a) Design the DFA that accepts an even number of a's and even number of b's.
- (b) Consider the DFA given below and identify the L accepted by the machine.



- (c) State the pumping lemma theorem for regular languages.
- (d) Convert the FA given below to left linear grammar.

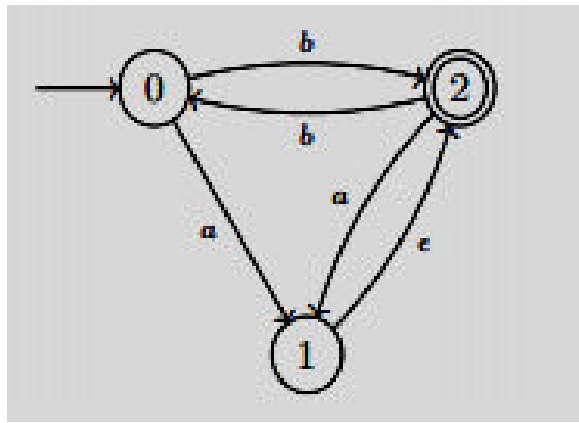


- (e) Check whether the grammar is ambiguous or not.
 $R \rightarrow R+R / RR / R^* / a / b / c$. Obtain the string $w = a+b*c$
- (f) $S \rightarrow aB/bA$ $A \rightarrow a/aS/bAA$ $B \rightarrow b/bS/aBB$. Identify the strings obtained from this grammar.
- (g) Define PDA. Draw the graphical representation for PDA.
- (h) Design a PDA which accepts set of balanced paranthesis ({ { { } } }).
- (i) Eliminate unit productions in the grammar. $S \rightarrow A/bb$ $A \rightarrow B/b$ $B \rightarrow S/a$
- (j) What are checking off symbols?

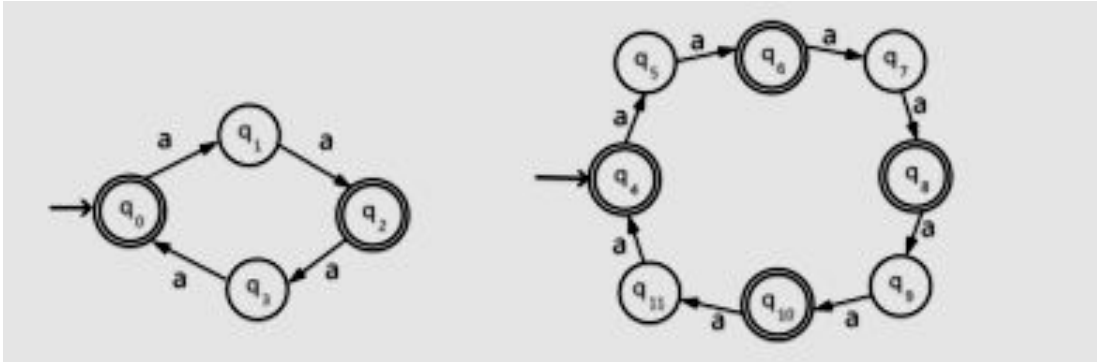
SECTION – B

2. Attempt any five of the following questions: 5 x 10 = 50

- (a) (i) Convert the NFA- ϵ to DFA.



(ii) Check with the comparison method for testing equivalence of two FA given below.



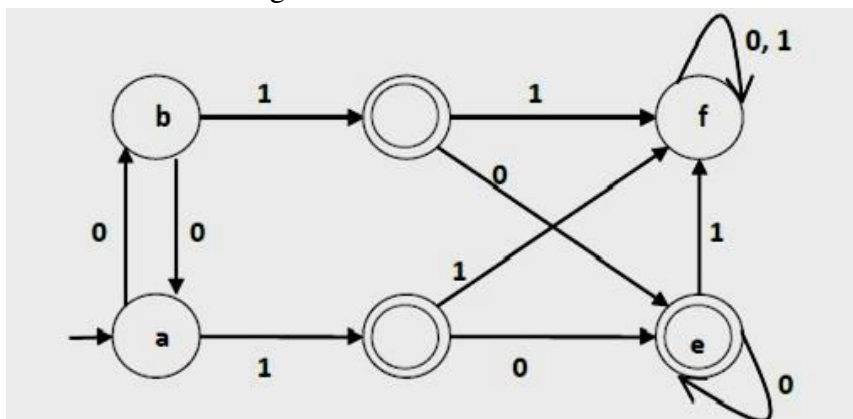
- (b) Prove that the compliment, homomorphism and inverse homomorphism, closure of a regular language is regular.
- (c) State and prove kleene's theorem with an example.
- (d) Consider the grammar with the production $S \rightarrow aSS$ $A \rightarrow b$. Compute the string $aababbb$ with the left most and right most derivation. Draw the derivation tree.
- (e) (i) Find out whether the language $L = \{x^n y^n z^n \mid n \geq 1\}$ is context free or not.
(ii) Construct a PDA that accepts $L = \{ww^R \mid w = (a+b)^*\}$
- (f) (i) Convert the following CFG into CNF
 $S \rightarrow XY \mid Xn \mid p$
 $X \rightarrow mX \mid m$
 $Y \rightarrow Xn \mid o$
 (ii) Convert the following CFG into CNF $S \rightarrow ASA \mid aB, A \rightarrow B \mid S, B \rightarrow b \mid \epsilon$
- (g) Design a TM to recognize all strings consisting of an odd number of a 's.
- (h) Prove that the halting problem is undecidable.

SECTION – C

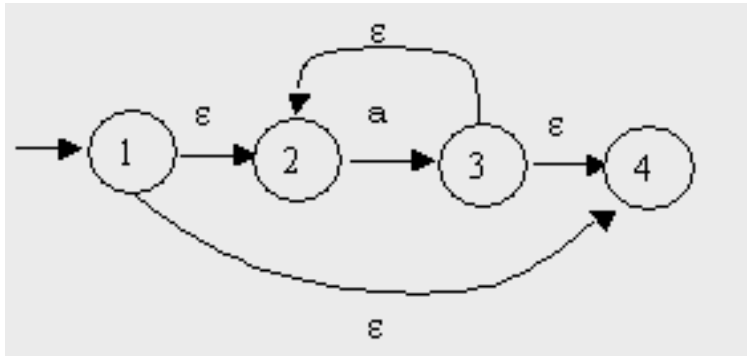
Attempt any two of the following questions:

2 x 15 = 30

3. (a) Minimize the automata given below



- (b) Compute the epsilon- closure for the given NFA. Convert it into DFA.



4. (a) Construct PDA to accept $L = \{0^n 1^n \mid n \geq 0\}$
(b) Construct a PDA from the following CFG.
 $G = (\{S, X\}, \{a, b\}, P, S)$ where the productions are –
 $S \rightarrow XS \mid \epsilon, A \rightarrow aXb \mid Ab \mid ab$
5. (a) Prove that single tape machines can simulate multi tape machines.
(b) Design a TM to recognize all strings consisting of an odd number of a 's.