

الإسم الرقم

أجب عن جميع الأسئلة
ورقة الإمتحان تشتمل على 8 صفحات

Question 1:

a- **Select the best answer for each of the following: (18 points)**

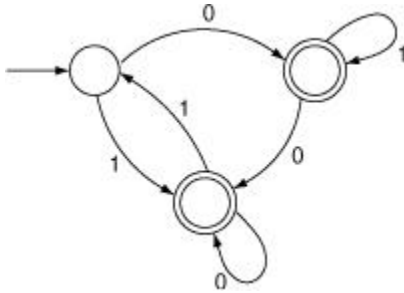
1. Which of the following regular expression is **equivalent** to $a^*(a^*+b^*)$
a) $(a+b)^*(\epsilon+a)^*$ b) $a^*+b^*a^*$ c) $a^++b^*a^*$ d) $a^++a^+b^*$
2. Consider the following CFG:

$$S \rightarrow AB \quad A \rightarrow aaA \quad B \rightarrow Bb$$

$$A \rightarrow \epsilon \quad B \rightarrow \epsilon$$

Consider this **derivation** $S \Rightarrow AB \Rightarrow aaAB \Rightarrow aaABb \Rightarrow aaBb \Rightarrow aab$, This derivation is

- a) a leftmost derivation
b) neither leftmost nor rightmost
c) a rightmost derivation
d) both
3. Which string is **accepted** by the following FA?



- a) 10100 b) 00001 c) 11011 d) 00100
4. $a^*c^*b^*$ **denotes:**
a) $\{w/w \text{ is a string of } a, b, c\}$ c) $\{a^n c^m b^n \mid n, m \geq 0\}$
b) $\{a^n c^n b^n \mid n \geq 0\}$ d) $\{a^n c^m b^l \mid n, m, l \geq 0\}$
5. A language is represented by a regular expression $(a)^*(a + ba)$. Which of the following string **does not** belong to the regular set represented by the above expression.
a) aaa
b) aba
c) $ababa$
d) aa

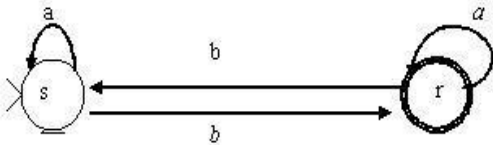
6. Which of the following strings is **not generated** by the following **grammar**? $S \rightarrow SaSb|\epsilon$
 a) ab b) $abab$ c) $aaababb$ d) $aabb$
7. Which of the following regular expression is **equivalent** to $(a+b)^*a^*$
 a) $(a+b)^*(\epsilon+a)^*$ b) $a^*+b^*a^*$ c) $a^+ + b^*a^*$ d) $(a^*+b^*)a^*$
8. Consider the following **CFG**:

$$S \rightarrow AB \quad A \rightarrow aaA \quad B \rightarrow Bb$$

$$A \rightarrow \epsilon \quad B \rightarrow \epsilon$$

Consider this **derivation** $S \Rightarrow AB \Rightarrow aaAB \Rightarrow aaA \Rightarrow aaBb \Rightarrow aab$, This derivation is

- a) a leftmost derivation
 b) nether leftmost nor right most
 c) a rightmost derivation
 d) both
9. Which string in is **accepted** by the following FA?



- a) a b) ba c) aaa d) bab
10. a^*cb^* **denotes**:
 a) $\{w/w \text{ is a string of } a, b, c\}$ c) $\{a^n cb^m / n, m > 0\}$
 b) $\{a^n cb^n / n > 0\}$ d) $\{a^n c^m b^l / n, m, l > 0\}$
11. Which of the following regular expressions **denotes** a language comprising of all possible strings over $\Sigma = \{a, b\}$ of length n where n is a multiple of 2
 a) $(a + b + aa + bb + ab + ba)^*$ c) $(aa + bb)^*$
 b) $((a + b)(a + b))^*$ d) $(aa + ab + a) + (bb + bb + a)$
12. Consider this **TM** which has this transition function

State	1	0	B
q(starting state)	(p,1,R)	(p,1,R)	(q,B,R)
P	(q,1,L)	halt	(q,0,L)

Identify a string that makes the machine **halts** from the list below:

- a)1010 b)011 c) 111 d) B
13. Using the **TM** given in question **12** above, identify a sting that makes the machine **doesn't halt**
 a) 0101 b) 011 c) B d) b) and c)
14. Which of the following regular expression are **equivalent**?
 a) $(a+b)^*(\epsilon+a)^*$
 b) $(a+b)^*a^*$
 c) $a^*+b^*(\epsilon+a)^*$
 d) $a^*+b^*a^*$

2- Which of those statement is true: : (10 points)

- a- Computation is searching a solution to a problem. ()
- b- Automata it is self-operational. ()
- c- An automaton is consisting of control unit. ()
- d- The finite state machine can count just two symbols. ()
- e- The context free language can count just two symbols. ()
- f- State is complete set of properties. ()
- g- Transition is act of passing state to another. ()
- h- Regular expression it representing in algebraic fashion. ()
- i- In Mealy machine the output is determined by the current state alone. ()
In Moore machine the output is determined by the current state and input.()

a) **Convert** the following regular expression to a
NFA accepting the **same** language
 $(ba \cup bb)^*$

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

c) **Minimize** the above **DFA**.

Question 2: (13 points)

1) Write the **formal** definitions of the **CFG** and **Explain** the entity:

Question 5: (7 points)

Draw the transition diagram of a TM (Turing Machine) that accepts the language wCw . where w is a string over the binary alphabet i.e. $\{0,1\}$

Good luck