

### Online Test Dashboard

Test Id	Home	View	results	Explanation
test10	( <a href="http://tests.gateforum.com/userhome.php">http://tests.gateforum.com/userhome.php</a> )	( <a href="http://tests.gateforum.com/viewresults.php?test_id=test10">http://tests.gateforum.com/viewresults.php?test_id=test10</a> )	( <a href="http://tests.gateforum.com/showExplanation.php?test_id=test10">http://tests.gateforum.com/showExplanation.php?test_id=test10</a> )	

#### Question #1

#### Q. No. 1 - 10 Carry One Mark Each

1. The language over the alphabet  $\Sigma = \{0,1\}$  represented by the regular expression  $(00+01+10+11)^*$  contains only
- (A) all strings starting with 00                      (B) all strings ending with 11
- (C) all even length strings                      (D) none of these

Answer Given : C

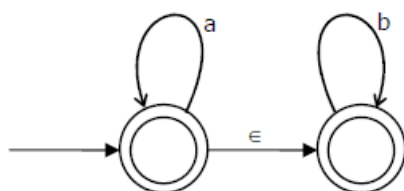
Correct Answer : C

1. It is not necessary for strings to start with 00 and end with 11, it generates all even length strings.



#### Question #2

2. The regular expression for the following NFA with  $\epsilon$  is



- (A)  $a^*$                       (B)  $a^*b$                       (C)  $ab^*$                       (D)  $a^*b^*$

Answer Given : D

Correct Answer : D

2. The set accepted by the machine is  $\{ \epsilon, a, b, ab, bb, aab, aabb, abbb, aaaab, \dots \}$   
Hence  $a^*b^*$  is the regular expression.



#### Question #3

3. Which of the following statements are true?
- i. Every regular language is a context free language.
- ii. Every context free language is a regular language.
- (A) (i) only                      (B) (ii) only
- (C) Both (i) & (ii)                      (D) Neither (i) nor (ii)

Answer Given : A

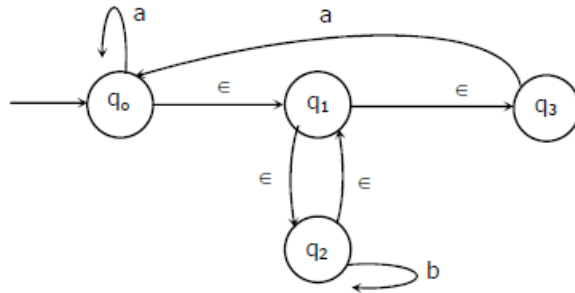
Correct Answer : A

3. Regular grammar is a subset of Context free Grammar.



Question #4

4. In the following diagram,  $\epsilon$ -closure ( $q_0$ ) is



- (A)  $\{q_1, q_2, q_3\}$       (B)  $\{q_1, q_3\}$       (C)  $\{q_0, q_1, q_3\}$       (D)  $\{q_0, q_1, q_2, q_3\}$

Answer Given : D

Correct Answer : D



Question #5

5. Consider the following grammar

$E \rightarrow E+T / T$

$T \rightarrow T * F / F$

$F \rightarrow (E) / id$

The above grammar has

- (A) Ambiguity      (B) Left recursion      (C) Both (A) & (B)      (D) None of these

Answer Given : B

Correct Answer : B

5. It is unambiguous, since the grammar is generating only one parse tree for any string.



Question #6

6. The following language  $L = \{0^n 1^m \mid n \geq 0 \text{ and } m \geq 0\}$  can be designed by

- (A) Finite Automata      (B) Pushdown Automata  
(C) Turing Machine      (D) All of these

Answer Given : D

Correct Answer : D

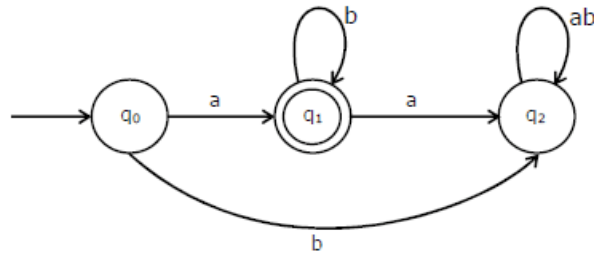
6. Since the language generated by the grammar is  $0^*1^*$ , it can be designed by finite automata, and hence it can be designed by PDA and TM also.



### Question #7

7. In the given figure,  $q_2$  is

- (A) Final state
- (B) Start state
- (C) Trap state
- (D) None of these



Answer Given : C

Correct Answer : C

7. Trap state is a state from which we will be not coming back to final state for any input. In the given DFA,  $q_2$  is trap state.



### Question #8

8. NFA and DFA differ in

- (A) Start state
- (B) Transition function
- (C) Input alphabet
- (D) All of these

Answer Given : B

Correct Answer : B

8. The only difference between NFA and DFA is the transition function.

for DFA  $\delta : Q \times \Sigma \rightarrow Q$

for NFA  $\delta : Q \times \Sigma \rightarrow P(Q)$



### Question #9

9. Consider an NFA in which we have  $Q$  states, then the maximum number of states possible in equivalent DFA is

- (A)  $2 \times Q$
- (B)  $\frac{Q}{2}$
- (C)  $2^Q$
- (D)  $Q^2$

Answer Given : C

Correct Answer : C

9. Number of states in the equivalent DFA for an NFA having  $q$  states is atmost  $2^q$ .



### Question #10

10. The useless symbols in the following grammar is/are  
 $S \rightarrow AB / a, A \rightarrow a$   
(A) A (B) B (C) Both A & B (D) None of these

Answer Given: B

Correct Answer : C

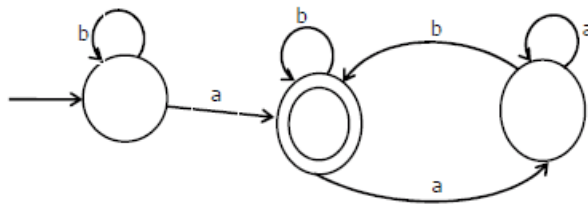
10. B is useless symbol as B is not generating any terminal. So once we remove the production  $S \rightarrow AB$  from the given grammar A will also become useless symbol.



Question #11

Q. No. 11 - 20 Carry Two Marks Each

11. Write the english description of the language accepted by the automaton depicted in the following diagram.



- (A) Some strings have exactly one 'a'  
(B) If it has got more than one 'a' it should end with b  
(C) Both (A) & (B)  
(D) None of these

Answer Given: C

Correct Answer : C



Question #12

12. Which one of the following regular expressions is NOT equivalent to the regular expression  $(a + b + c)^*$ ?  
(A)  $(a^* + b^* + c^*)^*$  (B)  $(a^*b^*c^*)^*$   
(C)  $((ab)^* + c^*)^*$  (D)  $(a^*b^* + c^*)^*$

Answer Given: C

Correct Answer : C

12. In option (C), 'a' must be followed by 'b'.



### Question #13

13. Which of the following problems is not decidable for CFL?
- (A) Membership (B) Ambiguity  
(C) When L is empty (D) Whether L is finite

Answer Given :

Correct Answer : B

13. Ambiguity is undecidable for context free language as there is no algorithm to check the ambiguity of the grammar.



### Question #14

14. Which of the following language is regular?
- (A)  $L = \{a^p / p \text{ is Prime}\}$  (B)  $L = \{a^{2n} b^{2n+1} / n \geq 1\}$   
(C)  $L = \{a^i / i \geq 1\}$  (D)  $L = \{a^n b^n / n \geq 1\}$

Answer Given :

Correct Answer : B



### Question #15

15. The following regular grammar represents the languages ending with
- $A \rightarrow 0A / 1B, \quad B \rightarrow 0A / 1B / 0$
- (A) 11 (B) 00 (C) 10 (D) 01

Answer Given : C

Correct Answer : C

15.  $A \rightarrow 0A$   
 $\rightarrow 01B$   
 $\rightarrow 010A$   
 $\rightarrow 0101B$   
 $\rightarrow 01010$   
 Consider any derivation, string will end in 10



### Question #16

16. Which of the following regular expressions are equivalent?

- (I)  $1^*(1 + \epsilon)$       (II)  $1^+$       (III)  $1^*$       (IV)  $\epsilon$   
 (A) I & II      (B) I & III      (C) I & IV      (D) None of these

Answer Given: B

Correct Answer : B

16. Both represent the same set  $\{\epsilon, 1, 11, 111, \dots\}$



### Question #17

#### Common Data Questions: 17 & 18

Consider the following PDA  $M = (\{q_0, q_1, q_2\}, \{a, b\}, \{X\}, S, z_0, q_0, q_2)$

$\delta(q_0, a, z_0) = (q_0, Xz_0)$

$\delta(q_0, a, X) = (q_0, XX)$

$\delta(q_0, b, X) = (q_1, X)$

$\delta(q_1, b, X) = (q_1, X)$

$\delta(q_1, c, X) = (q_2, \epsilon)$

$\delta(q_2, c, X) = (q_2, \epsilon)$

$\delta(q_2, \epsilon, z_0) = (q_2, \epsilon)$

17. Which of the following language is accepted by empty stack?

- (A)  $\{a^m b^n c^m / m, n > 1\}$       (B)  $\{a^m b^m c^n / m, n > 1\}$   
 (C)  $\{a^m b^m c^m / m, n \geq 1\}$       (D)  $\{a^m b^n c^m / m, n \geq 1\}$

Answer Given: D

Correct Answer : D



### Question #18

Consider the following PDA  $M = (\{q_0, q_1, q_2\}, \{a, b\}, \{X\}, S, z_0, q_0, q_2)$

$\delta(q_0, a, z_0) = (q_0, Xz_0)$

$\delta(q_0, a, X) = (q_0, XX)$

$\delta(q_0, b, X) = (q_1, X)$

$\delta(q_1, b, X) = (q_1, X)$

$\delta(q_1, c, X) = (q_2, \epsilon)$

$\delta(q_2, c, X) = (q_2, \epsilon)$

$\delta(q_2, \epsilon, z_0) = (q_2, \epsilon)$

18. Which of the following instantaneous description is correct for the input aaabbccc?

(A)  $(q_0, abc, Z_0) \rightarrow (q_0, bc, XZ_0)$

$\rightarrow (q_1, c, XZ_0)$

$\rightarrow (q_1, \epsilon, Z_0)$

$\rightarrow (q_2, \epsilon, \epsilon)$

(B)  $(q_0, abc, Z_0) \rightarrow (q_0, bc, XZ_0)$

$\rightarrow (q_0, c, XZ_0)$

$\rightarrow (q_1, \epsilon, Z_0)$

$\rightarrow (q_2, \epsilon, \epsilon)$

(C)  $(q_0, abc, Z_0) \rightarrow (q_0, bc, XZ_0)$

$\rightarrow (q_1, c, Z_0)$

$\rightarrow (q_1, \epsilon, Z_0)$

$\rightarrow (q_2, \epsilon, \epsilon)$

(D)  $(q_0, abc, Z_0) \rightarrow (q_1, bc, XZ_0)$

$\rightarrow (q_1, c, Z_0)$

$\rightarrow (q_2, \epsilon, \epsilon)$

**Answer Given :**

**Correct Answer : A**

18. Consider the input aaabbccc it will make the stack empty  
OR  
Design a PDA and check the input aaabbccc



**Statement for Linked Answer Questions: 19 & 20**

Given grammar  $G(\{S\}, \{a,b\}, P, S)$  is  $S \rightarrow aSa$

19. Which of the following productions to be added to the grammar, so that it generates even palindrome?  
 (A)  $S \rightarrow bsb$       (B)  $S \rightarrow bsb/\epsilon$       (C)  $S \rightarrow bb/\epsilon$       (D)  $S \rightarrow bsb/b/a$

**Answer Given : B**

**Correct Answer : B**

19. The grammar  $S \rightarrow aSa / bSb / \epsilon$  will generate all the even length palindromes.

**Question #20**

Given grammar  $G(\{S\}, \{a,b\}, P, S)$  is  $S \rightarrow aSa$

20. Which of the following productions should be added in addition to the above result to generate all the palindromes (both even and odd palindromes)?  
 (A)  $S \rightarrow aa/bb/\epsilon$       (B)  $S \rightarrow bsb/\epsilon$       (C)  $S \rightarrow b/a$       (D)  $S \rightarrow bsb$

**Answer Given : C**

**Correct Answer : C**

20. The grammar  $S \rightarrow aSa / bSb / a / b/\epsilon$  will generate both even length and odd length palindromes.



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