CAREER ENDEAVOUR
ACADEMY PRIVATE LIMITED
Best Institute for NET-JRF, GATE & IIT-JAM Exams

UGC-NET-COMPUTER SCIENCE & APPLICATIONS

Unit Test-1: *THEORY OF COMPUTATION*

Time: 00:30 Hour **Date : 24-02-2014**
M.M. : 30

INSTRUCTIONS: Attempt all the 15 questions. Each question carry two marks.

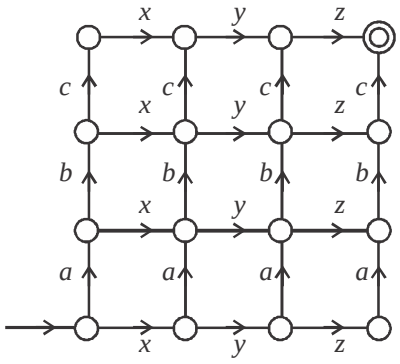
1. Minimum number of states in a DFA that accepts the binary language in which n^{th} symbol from the begining is 1 and n^{th} symbol from the last is 0 is
(a) 2^{n+2} (b) $n2^n + 2^{n+1}$ (c) $n2^n + 2^n$ (d) $n2^{n+1}$

2. The languages generated by this grammaers is
$S \rightarrow aS \mid Sb \mid \lambda$
(a) {a, b}* (b) a*b* (c) {a, b}$^+$ (d) b*a*

3. The length of a longest string that is not a member of $(1^p + 1^q)^*$ where p and q are co-prime
Note: p and q are co-prime if there gcd is1.
(a) p + q –1 (b) pq – p – q (c) p + q – pq (d) pq + p + q

4. Consider the following grammar
$S \rightarrow AB$
$A \rightarrow BaB \mid a$
$B \rightarrow bbA$
which of the following is false
(a) The length of every string produced by the grammar is EVEN
(b) NO strings produced by the grammar has 3 consecutive a's
(c) No strings produced by the grammar has an odd number of consecutives b's
(d) No string produced by the grammar has 4 consecutive b's

5. The finite automata below recognizes a set of strings of length 6. What is the total strings in the set?



(a) 18 (b) 20 (c) 30 (d) 32

6. Consider the DFA with states Q = <0, 1, 2, 3, 4> and input alphabet $\Sigma = \{0,1\}$ start state is 0 and final state is 0. The transition function is defined as follows

$$\delta(q,i) = (q^2 - i) \bmod 5 \qquad q \in Q,\ i \in \{0,1\}$$

The above DFA accepts all binary strings containing

(a) Even number of 1's (b) Odd number of 1's
(c) Even number of 0's (d) Odd number of 0's

7. Consider the grammar

$S_n \longrightarrow S_{n-1}\, S_{n-1}$
$S_{n-1} \longrightarrow S_{n-2}\, S_{n-2}$
$\vdots$
$S_2 \longrightarrow S_1 S_1$
$S_1 \longrightarrow S_0 S_0$
$S_0 \longrightarrow a \mid b$ and S_n is the start symbol.

The language generated by the above grammar is

(a) $(a + b)^n$ (b) $(a + b)^{2n}$ (c) $(a+b)^{2^n}$ (d) None of the above

8. The number of state in a DFA for the language

$$L = \left\{ w \in (a,b)^* \mid \text{for every prefix y of w } 0 \le N_a(y) - N_b(y) \le n \right\}$$

is

(a) n (b) n + 1 (c) n + 2 (d) 2n + 1

9. Which of the following is false

(a) $\frac{d(L^*)}{da} = \frac{dL}{da} L^*$ (b) $\frac{d(LM)}{da} = \frac{dL}{da} M + L \frac{dM}{da}$

(c) $\frac{dL}{d(ab)} = \frac{d}{da}\left(\frac{dL}{db}\right)$ (d) $\frac{d(Lb)}{db} = L$

Note: L and M are languages. $\frac{dL}{da}$ = derivative of L w.r.t. a.

10. If a DFA have n state with f final states, accepts the language L then number of final states in DFA accepting the language $\overline{L}$ is

(a) f (b) n + f (c) n – f (d) nf

11. How many strings the following grammar generate?

$$A \to BB,\ B \to CC,\ C \to 1 \mid 2 \mid \lambda$$

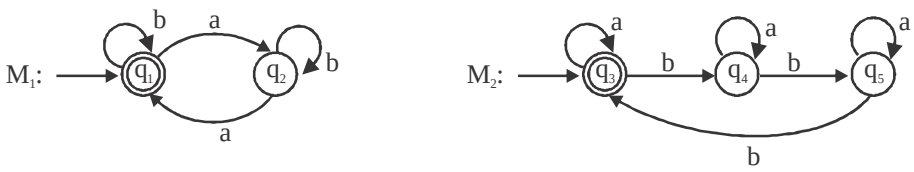
(a) 64 (b) 32 (c) 16 (d) 31

12. How many distinct string are there in the language of the regular expression?

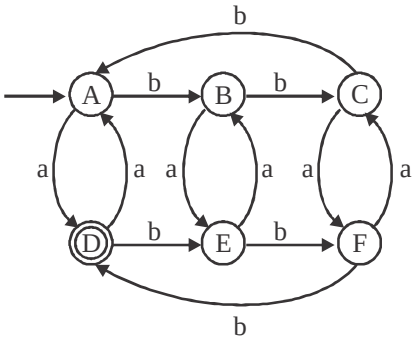
$$(0+1+\lambda)(0+1+\lambda)(0+1+\lambda)(0+1+\lambda)$$

(a) 31 (b) 64 (c) 81 (d) 32

13. Consider the two DFA's



Consider the follwoing machine M_3.



Which of the following is TRUE for above FA

(a) $M_3 = M_1 - M_2$ (b) $M_3 = M_2 - M_1$ (c) $M_3 = M_1 \cup M_2$ (d) $M_3 = M_1 \cap M_2$

14. Consider the grammar

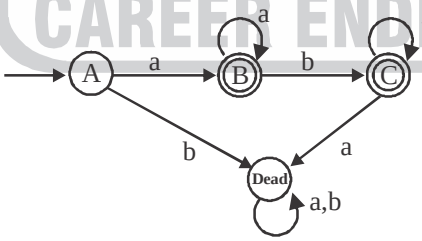
$S \to aS \mid aA, \quad A \to bA \mid bB \quad B \to cB \mid c$

The language generated by above grammar is

(a) $\{(abc)^n \mid n \geq 1\}$ (b) $\{a^n b^n c^n \mid n \geq 1\}$

(c) $\{a^n b^n c^m \mid m, n \geq 1\}$ (d) $\{a^m b^n c^p \mid m \geq 1,\ p \geq 1, n \geq 1\}$

15. Consider the finite automata



The language accepted by above FA is

(a) $\{a^m b^n \mid m \geq 0, n \geq 0\}$ (b) $\{a^m b^n \mid m \geq 0, n \geq 1\}$

(c) $\{a^m b^n \mid m \geq 1, n \geq 0\}$ (d) $\{a^m b^n \mid m \geq 1, n \geq 1\}$

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1. (b)	**2. (b)**	**3. (b)**	**4. (d)**	**5. (b)**	**6. (a)**	**7. (c)**
8. (c)	**9. (b)**	**10. (c)**	**11. (d)**	**12. (a)**	**13. (b)**	**14. (d)**
15. (c)						