KONGU ENGINEERING COLLEGE, PERUNDURAI 638 060

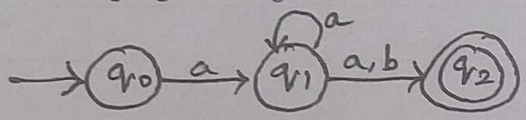
CONTINUOUS ASSESSMENT TEST 1

(Regulations 2022)

Month and Year : September 2024	Roll Number: 22CSR070
Programme : B.E Branch : CSE Semester : V	Date : 02.09.2024 Time : 9.15 am to 10.45 am
Course Code : 22CST53 Course Name : Theory of Computation	Duration : 1 ½ Hours Max. Marks : 50

PART - A (10 × 2 = 20 Marks)
ANSWER ALL THE QUESTIONS

1. Mention the steps to be followed to solve problems in mathematical induction. [CO1] [K2]
2. Distinguish between DFA and NFA. [CO1] [K2]
3. Using proof by deduction, prove that if x is an even number then x^2 is also an even number. [CO1] [K3]
4. Design a DFA that accepts string of the language L={a^m b^n | m and n are positive integers} [CO1] [K3]
5. If ∑= { ab, bb}, find $∑^4$. [CO1] [K3]
6. Prove that, if a % b=b % a then a=b. [CO1] [K3]
7. Find the language of the given NFA. [CO1] [K3]



8. Identify the operators of regular expression and state its priority. [CO2] [K2]
9. Write the regular language for the regular expression (0*1*)*000(0+1)* [CO2] [K2]
10. If L= {10, 1}, Find L*. [CO2] [K3]

Part – B (3 × 10 = 30 Marks)
ANSWER ANY THREE QUESTIONS

11. (i) Prove by mathematical induction, $2+2^2+2^3+.....+2^n=2^{n+1}-2$. (5) [CO1] [K2]

    (ii) Prove the statement: Every tree has one node more than its edges. (5) [CO1] [K2]

12. Convert the following NFA to DFA. (10) [CO1] [K3]

States	Input	
	0	1
→p	{p,r}	{q}
q	{r,s}	{p}
*r	{p,s}	{r}
*s	{q,r}	{Φ}

13. Consider the following ε-NFA (10) [CO1] [K3]

States	Input		
	A	B	ε
→p	{q}	{p,r}	{r}
q	{p}	{Φ}	{Φ}
*r	{r}	{p}	{p,q}

(i)Compute the ε-closure for each state.

(ii) Convert the ε- NFA to DFA.

(iii)Write the set of all strings of length 3 or less accepted by the automata.

14. Consider the DFA given by the transition table (10) [CO1] [K3]

States	Input	
	0	1
→q1	{q2}	{q3}
q2	{q3}	{q5}
*q3	{q4}	{q3}
q4	{q3}	{q5}
*q5	{q2}	{q5}

(i) Draw the table of distinguishabilities for this automaton.

(ii) Construct the minimum state equivalent DFA.

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analysing (K4)	Evaluating (K5)	Creating (K6)
Percentage	-	30	70	-	-	-

KONGU ENGINEERING COLLEGE, PERUNDURAI 638 060

CONTINUOUS ASSESSMENT TEST 2

(Regulations 2022)

Month and Year : October 2024	Roll Number: 22CSR067
Programme : B.E Branch : CSE Semester : V	Date : 15.10.2024 Time : 1.15 pm to 2.45 pm
Course Code : 22CST53 Course Name : Theory of Computation	Duration : 1 ½ Hours Max. Marks : 50

PART - A (10 × 2 = 20 Marks)

ANSWER ALL THE QUESTIONS

1. Write the regular expression for the language starting and ending with a and having any number of b's in between. [CO2] [K2]
2. Identify the purpose of pumping lemma in regular language. Give the necessary conditions. [CO2] [K2]
3. Design an Є-NFA for the regular expression a+b*c. [CO2] [K3]
4. Show that the complement of a regular language is also regular. [CO2] [K3]
5. Consider the grammar G=(N,T,P,S) and N={S} T={a,b}, P=S→aSb, S→ab. Write L(G). [CO3] [K2]
6. Consider the context free grammar (CFG) given below. Write the leftmost derivation for the string bbaa. [CO3] [K3]

   S→bS | aT | Є
   T→aT | bU | Є
   U→a | E
7. Show that the given grammar is ambiguous. [CO3] [K3]

   S→ SbS | a
8. Construct a CFG for a set of strings that contains equal number of a's and b's over ∑={a,b}. [CO3] [K3]
9. Draw pushdown automata to accept strings of the language L={ 0^n1^n | n > 0} [CO3] [K3]
10. Specify the different ways of language acceptance in PDA and write their representations. [CO3] [K2]

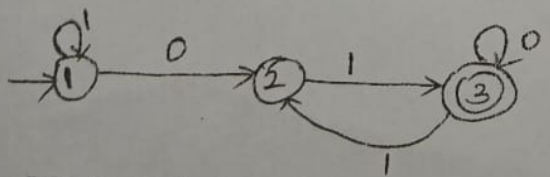
Part – B (3 × 10 = 30 Marks)

ANSWER ANY THREE QUESTIONS

11. i) Demonstrate how the set L={a^p/p is prime} is not regular. (5) [CO2] [K2]

    ii) Draw an Є-NFA for the given regular expression. (5) [CO2] [K2]

    10+(0+11)0*1
12. Deduce into regular expression that denotes the language accepted by following DFA. [CO2] [K3]



13. Construct PDA for the language L = {WcW^R | W ∈ {0,1}+} by final state. [CO3] [K3]
14. For the given context free language L={a^nbc^n | n>0} find the equivalent PDA using empty stack. [CO3] [K3]

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analysing (K4)	Evaluating (K5)	Creating (K6)
Percentage	-	30	70	-	-	-

KONGU ENGINEERING COLLEGE, PERUNDURAI 638 060
CONTINUOUS ASSESSMENT TEST 3
(Regulations 2022)

Month and Year : November 2024	Roll Number: 22CSR070
Programme : B.E Branch : CSE Semester : V	Date : 21.11.2024 Time : 1.15 pm to 2.45 pm
Course Code : 22CST53 Course Name : Theory of Computation	Duration : 1 ½ Hours Max. Marks : 50

PART - A (10 × 2 = 20 Marks)
ANSWER ALL THE QUESTIONS

1. Prove that the language L = {$a^i b^j$; i≤j} is not CFL using pumping lemma. [CO4] [K3]
2. Remove the null productions from the given grammar. [CO4] [K3]
   S → ABAC
   A → aA / ϵ
   B → bB / ϵ
   C → c
3. Draw a Turing Machine that accept language ∑ = {a, b} that contain strings that ends with a. [CO4] [K3]
4. Design s Turing machine to perform f(x,y) = x+y. [CO4] [K3]
5. How to remove unit productions in CFG? Write an example. [CO4] [K2]
6. Compare recursive and recursively enumerable language. [CO5] [K2]
7. Identify the reason for a problem to be undecidable. Give an example of undecidable problem. [CO5] [K2]
8. Prove that if a language L and its complement L^1 are recursively enumerable then L is recursive. [CO5] [K2]
9. Find the solution of an instance of PCP with two lists A and B. [CO5] [K3]
   A=[aa, bb, abb] and B=[aab, ba, b]
10. Provide example for tractable and intractable problems. [CO5] [K2]

Part – B (3 × 10 = 30 Marks)
ANSWER ANY THREE QUESTIONS

11. Convert the given CFG to GNF (10) [CO4] [K3]
    S→AA / a
    A→SS / b
12. Design a Turing Machine (M) to implement MULTIPLICATION function using the subroutine copy. (10) [CO4] [K3]
13. Prove the following (10) [CO5] [K2]
    (i) "If L1 and L2 are recursive language then L1 U L2 is a recursive language".
    (ii) Lu is recursively enumerable and Ld is recursive.
14. (i) Explain storage in finite control with suitable example. (5) [CO4] [K2]
    (ii) Obtain the code for the Turing Machine (5) [CO5] [K3]
    M= $(\{q_0, q_1, q_2, q_3, q_4\}\ \{0,1\}\ \{0,1,X, Y, B\},\ \delta,\ q_0,\ B\ \{q_4\})$ where δ is given by
    $\delta(q_0, 0) = (q_1, X, R)$ $\quad$ $\delta(q_2, 0) = (q_2, 0, L)$
    $\delta(q_0, Y) = (q_3, Y, R)$ $\quad$ $\delta(q_2, X) = (q_0, X, R)$

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analysing (K4)	Evaluating (K5)	Creating (K6)
Percentage	-	40	60	-	-	-