13/11/24
III

Registration No:

II In- Semester Examination November 2024

B.Tech CSE V Sem. (Common for all specialization except TCS)

Subject: Formal Lang[illegible]es & Automation Theory

Subject [illegible] [illegible]CO 017A

Time: 1.30 hr. **Maximum Marks: 40**

CO3: Construct pushdown automata and the equivalent context free grammars.

CO4: Prove the equivalence of languages described by pushdown automata and context free grammars.

Section –A (Very Short answers) **(2*2=4 Marks)**

(CO3) Q1. G is $S \rightarrow aS|bS|a|b$ Find L (G)

(CO4) Q2. Explain block diagram of push down automata.

Section – B (Short answers) **(7*2=14 Marks)**

(CO3) Q1. (A) If G = ({S, C}, {a, b}, $\{S \rightarrow a^i b^i c^j,\ i>=1, j>=0\}$, S), Find L(G).

(CO3) *Q1. (B) Consider the production rules of grammar G.* Prove L(G)= $\{a^n b^m \mid m>n,\ n>=0\}$ is Generated by G={(S,A,B},(a,b), $S \rightarrow AbB$, $A \rightarrow aAb$ / ^, $B \rightarrow bB$ / ^ ,S}

(CO4) Q2. Explain PDA and its operation. Construct the PDA for the following languages.
$\{ wcw^R \mid w \in (0+1)^+ \}$

Section –C (Long Answers) **(11*2=22 Marks)**

(CO3) Q1. (A) Define ambiguous grammar. Check Is Grammar ambiguous? $S \rightarrow SbS/a$

(CO3) Q1. (B) Find a grammar in Chomsky normal form equivalent to-
$S \rightarrow aAbB$, $A \rightarrow aA|a$, $B \rightarrow bB|b$.

(CO4) Q2. (A) Explain PDA and its operation. Construct the PDA for the following languages.
$\{ 1^n 2^{n+m} 3^m \mid n>=1,\ m>=1 \}$

(CO4) Q2. (B) Construct a PDA equivalent to the following CFG: $S \rightarrow 0BB$, $B \rightarrow 0S|1S|0$. Test whether 010^4 is in N(A).

13-12-2024/ TI

1 JECRC UNIVERSITY

...mputer Science and Engineering

...ND TERM B.Tech (CSE), Semester V

...T (Formal Language & Automation Theory) – BCO017A

Max Marks: 100

...questions.

...answers with suitable examples and diagrams wherever necessary

...relevant questions numbers before writing the answer

...Outcomes (CO):

...Understand and construct finite state machines and the equivalent regular expressions

...Prove the equivalence of languages described by finite state machines and regular expressions

...Construct pushdown automata and the equivalent context free grammars

...Prove the equivalence of languages described by pushdown automata and context free grammars

...Construct Turing machines and Post machines and prove the equivalence of languages described by Turing machine and Post machines

...TION-A (2 marks each) (10 marks)

...R be any set of regular languages. Is UR regular? Prove it. [CO1]

...at are the properties of Transition Function (δ)? [CO2]

...struct a DFA for the regular expression aa*bb* [CO3]

...ate a FA which checks whether the given binary number is even [CO4]

...some languages are not decidable or even Turing – recognizable? [CO5]

...TION-B (7 marks each) (35 marks)

...onstruct a finite automata for the regular expression (0+1)*(00+11)(0+1)*. [CO1]

...hat do you mean by the Chomsky Hierarchy in the formal language theory? Convert ...e given CFG into GNF S->AB,A->BS|1,B->SA|0 [CO2]

...ewrite the following grammar after eliminating ...e useless symbols S->AB|DS

...->Dd|E

... [CO3]

4. Convert the following NFA-ε into equivalent NFA without ε...

5. Construct a PDA that accepts the strings of language L={ wwR | w is in (a,b)*} [C...

SECTION-C (11 marks each) (55 marks)

1. Construct the PDA accepting the language
   - i. L= {(ab)^n |n>=1} by empty stack
   - ii. L= {$a^{2n}b^n$ |n>=1} Trace your PDA for the input with n=3.
   - iii. L= {ww^R|w is in (a+b)*}
   - iv. L= {0^n1^{2n}} by empty stack
   - v. L= {ww^{R}w|w is in (0+1)*} [CO1]
2. (i) Write Regular expression for the following: m>=2, n>=2}

   (ii) Write DFA to accept strings of 0's, 1's & 2's beginning with a 0 followed by ... number of 1's and ending with a 2. [CO2]
3. (i) ...ollowing CFG into ...

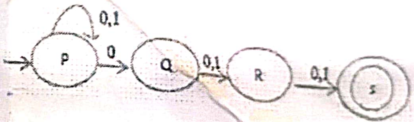
   A → Aa|a,

   B → Bb|b|ε

   ...bb|Aa|Bb

   (ii) Show that language of palindrome over {a,b} is not a regular l...

   [CO3]
4. (i) How a NFA can be converted into a DFA? Convert the following NF... equivalent DFA. [CO4]



   (ii) What is the difference between Mealy and Moore machine ?
5. Explain the different types of Turing Machine. Design a Turing Machi... the language of all strings over the alphabet ∑={a ,b} whose second la...

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