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| D:\VK\GIET LOGO.jpg | **GIET UNIVERSITY, GUNUPUR – 765022**B. Tech (Fourth Semester – Regular) Examinations, April / May – 2021 **– Formal Language & Automata Theory** **(Branch or Common to -------------)** |
| Time: 3 hrs Maximum: 70 Marks |

**Answer ALL Questions**

**The figures in the right hand margin indicate marks.**

**PART – A: (Multiple Choice Questions) (1 x 10 = 10 Marks)**

Q.1. Answer ***ALL*** questions

1. a) (iii) Q x Σ $∪ ${ $\in $} →2Q

b) (iii) Infinite tape length, unidirectional tape movement.

c) (iii) $δ$($δ\left(q,x\right),y)$

d) (ii) (r\*s\*)\* = (r+s)\*

e) (ii) S→a

f) (ii) PDA accepts some regular, all context free and some non-regular languages.

g) (i) GNF

h) (iv)TM

(i) Every recursively enumerable language is recursive.

j) (iv) A and B are disjoint sets.

1. a) Design a DFA that accepts the set {aan/n ≥ 1}

Sol: language identification & Construction of DFA 2M

b) Define Finite automata and mention any two applications of Finite Automata

Sol: Define Finite automata with applications 2M

c) Write the minimum length string which is not there in the language generated by 0\*1\*

Sol: $\in $ **2M**

d) Prove that the set L= {ap/p is prime} is not regular.
Soi: by using Application of a pumping lemma for regular sets 2M

e) Write the regular expression for the set of all strings of 0’s and 1’s ending with ‘00’

Sol: (0+1)\*00 2M

f) Write the model of a TM and what are the special features of a TM

Sl: Turing machine model and any two special features 2M

g) Elaborate on the concept of Post correspondence problem.

Sol: Post correspondence problem concept 2M

h) Give an example of a language which is accepted by DPDA and describe the language.

Sol: a language which is accepted by DPDA example 2M

i) Define Context Sensitive Languages and its applications.

Sol: Context Sensitive Languages definition and any two applications 2M

j) Write short notes on Recursively Languages with examples

Sol: Recursively Languages with examples 2M

1. a) Design a DFA for the following Language L={x01y/ x and y are any string of 0’s and 1’s}

and check the string ‘000110’.

Sol: Design a DFA for the following Language L={x01y/ x and y are any string of 0’s and 1’s}

 3M

check the string ‘000110’. 2M

b) Construct an NFA for the set of all strings such that the third symbol from the right side is one. Σ={0,1}

Sol: NFA for the set of all strings such that the third symbol from the right side is one. Σ={0,1}

 5M

(OR)

c) Construct a minimum state automaton equivalent to a given automaton M whose transition table is

|  |  |  |
| --- | --- | --- |
| State | 0 | 1 |
| →Q0 | Q1 | Q3 |
| Q1 | Q2 | Q4 |
| Q2 | Q1 | Q4 |
| Q3 | Q4 | Q2 |
| \*Q4 | Q4 | Q4 |

Sol: a minimum state automaton equivalent to a given automaton M 7M

d) Construct an NFA for the language L= { an u bn / n>=1 }

Sol: NFA Construction for given Language L= { an u bn / n>=1 } 3M

1. a) Draw a transition diagram of NFA with Є – Transitions for the Regular Expression

ab (a + b)\* ba .

Sol : NFA with Є – Transitions for the Regular Expression ab (a + b)\* ba 5M

b) Construct CFG’s for the language {w Є {0, 1}\* / w starts and ends with same symbol}

Sol: Context Free Grammar for Given w starts and ends with same symbol 5M

(OR)

c) Obtain a CFG to generate Equal number of 0’s and 1’s.

Sol: CFG to generate Equal number of 0’s and 1’s 5M

d) Draw parse Tree for the string ‘00110101’ using the following Grammar S🡪0B/1A, A🡪0/0S/1AA,

 B🡪1/1S/0BB

Sol: Draw parse Tree for the string ‘00110101’ 5M

1. a) Design a TM to compute one’s complement of a given binary number

Sol: TM to compute one’s complement of a given binary number 5M

b) Construct PDA for the following language L = {am b2m / n ≥ 1}

Sol: DPDA for the following language L = {am b2m / n ≥ 1} 5M

(OR)

c) Construct PDA equivalent to the following grammar S🡪aAA, A🡪aS/bS/a

Sol: PDA equivalent to the following grammar S🡪aAA, A🡪aS/bS/a 5M

d) Design a TM over Σ={0,1} to accept the language L={ 0m12m/ m>0}

Sol: TM over Σ={0,1} to accept the language L={ 0m12m/ m>0} 5M

1. a) Explain about NP complete and NP Hard problems with examples

Sol: NP hard problem Definition and examples 3M

 NP Complete Problems Definition and examples 2M

b) Describe in detail about Church Turing hypothesis.

Sol: Church Turing hypothesis 5M

(OR)

c) Design a TM to compute m-n, where m and n are positive integers and m>n

Sol: TM to compute m-n, where m and n are positive integers and m>n 5M

d) What is Recursively enumerable language? Explain.

Sol: Recursively enumerable language explanation 5M

--- End of Scheme ---