Total No. of Questions – [8] Total No. of Printed Pages [3]

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Paper Code: U359-122 (ESE) COMP
U359-142 (ESE) IT

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T. Y. B. TECH. (COMPUTER ENGINEERING /INFORMATION TECHNOLOGY) (SEMESTER - I)

COURSE NAME: THEORY OF COMPUTATION

COURSE CODE: CSUA31172 / ITUA31172

(PATTERN 2017)

Time: [2 Hours] [Max. Marks: 50]

(*) Instructions to candidates:

1) **Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1) a) Construct DFA for language defined by S = {0,1} where [6]

S = {strings ending with 0 always}
S = { strings representing odd binary numbers}
S = { strings over S* with total number of 0's even}

OR

b) Construct a Moore and Mealy machine to generate 1s compliment of a given binary number. [6]

Q.2) a) Using pumping lemma for regular Sets provide that the language, [6]

$L = \{0^m 1^n 0^{m+n} | m >= 1 \text{ and } n >= 1\}$ is not regular.

OR

b) Write Regular expression for each of the following languages: [6]

1. For $\Sigma = \{a,b\}$, set of all strings with no consecutive 'a's and 'b's.
2. For $\Sigma = \{a,b\}$, set of all strings in which every 0 is immediately followed by at least two 1's

Q.3) a) Check whether the given grammer is in CNF [6]

S->bA|aB
A->bAA|aS|a
B->aBB|bS|b

If it is not in CNF, Find the equivalent CNF

OR

b) Explain Chomsky Hierarchy of Grammar. [6]

Q.4) a) Construct a PDA for accepting a language $l=\{a^n b^{2n} | n>=1\}$ [4]

OR

b) Define PDA. What are different types of PDA? [4]

Q.5) a) Write short notes on [6]

i) Non Deterministic TM
ii) Composite TM

b) Design TM to accept the set L of all strings formed with 0&1 and Having Substring '000'. [4]

c) Construct a Turing Machine [4]

OR

Q.6) a) Design a Turing Machine to accept the language [6]
$L = \{w / w \in (a+b)^*\}$ containing the substring aab.

b) Write short notes on : [4]

1)Universal Turing Machine
2) Multi-tape Turing Machine

c) Construct a Turing Machine to accept an even palindrome over{a,b}. [4]

Q.7) a) Explain Tractable and Intractable problem. [6]

b) Define and explain Recursive and Recursively enumerable languages [4]

c) Explain in detail, the polynomial -time reduction approach for proving that a problem is NP- Complete. [4]

OR

Q.8) a) Explain post correspondence problem. [6]

b) Show that if a language L and its complement L are both recursively enumerable languages, then L is recursive. [4]

c) Differentiate between P and NP classes [4]