Mid-West University

Examinations Management Office

End Semester Examinations 2081

Bachelor level/ B.E. Computer/ 4th Semester — Full Marks: 50

Time: 3 hours — Pass Marks: 25

Subject: Theory of Computation (CO441/CO508)

- *Attempt all the questions*
- *Figures in the margin indicate full marks.*
- *Assume suitable values, with a stipulation, if necessary.*
- *Candidates are required to answer the questions in their own words as far as possible.*

1. What is the role of theory of computation for the development of AI tools? Differentiate between DFA & NFA. Construct an NFA accepting the set of all string whose second last symbol is 1 and show how the 11010 will be processed. **[1+1+3]**
2. How can you relate PDA and CFG? Explain how Pushdown automata are better than finite automata. **[2+3]**
3. Discuss the closure property of regular sets. Explain Pumping Lemma theory in the context of regular sets with your own example. **[2+3]**
4. What are derivative trees in context free grammar? Reduce the following grammer whose production rules are P: S → AB, A → a, B → b, B → D, E → d where, G = $(\sum(S,A,B,D,E)$, (a,b,d), P, S). **[2+3]**
5. **a.** Remove the **Unit production** from the Grammar. **[2.5]**

   S → XY, X → a, Y → Z | b, Z → M, M → N, N → a

   b. Show that L= $\{a^n b^n c^n \backslash N \geq 0\}$ is not a context free language. **[2.5]**

   [Use Pumping Lemma for CFL]
6. Represent PDA graphically. Construct a PDA that accepts even palindromes of the form

   L= $\{WW^R/W=(a+b)^+$ **[1+4]**
7. Define Turing Machine. Design a TM that accepts the language consisting of all binary strings where the number of 1s is divisible by 3. **[1+4]**
8. What is Universal Turing Machine? Explain the properties of recursive and recursive language. **[1+4]**
9. Explain P and NP class of problems. How can you Compare Decidability with Un-decidability? **[2+3]**
10. Write short notes on *(any two);* **[5]**
    - **a.** Church's Hypothesis
    - **b.** Computable language and functions
    - **c.** Theory of Computational Complexity

The End