Roll No……..….. **Total No. of Printed Pages: [01]**
Total No. of Questions: [11]

M. Sc. IT (Semester – 4th)
THEORY OF COMPUTATION
Subject Code: MITE1417
Paper ID: [220430]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It carries 16 marks. It consists of 4 questions of 4 marks each.
2. Section B consist of 4 questions of 8 marks each. The student has to attempt any 3 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(4 marks each)**

Q1. What is meant by union operation of languages?
Q2. Derive the string aaaaaabbbb for the given context free grammar: $S \rightarrow aAbB,\ A \rightarrow aAa|a,\ B \rightarrow bB|b$
Q3. Give and explain the basic model of PDA.
Q4. What is Context Sensitive Language? Give its one example.

Section – B **(8 marks each)**

Q5. Design an automata accepting strings generated over {a, b} and starting with ab.
Q6. Explain pumping lemma for CFG.
Q7. Convert the CFG in the question 2 above into Chomsky Normal Form.
Q8. What is Chomsky Hierarchy and its importance?

Section – C **(10 marks each)**

Q9. Design a DFA for accepting strings generated over {0, 1} having even number of 0's and 1's.
Q10. Design a PDA for accepting strings of the language $\{a^{n+1}b : n \text{ is a natural number}\}$ generated over {a, b}.
Q11. Design a Turing Machine to accept strings generated over {2, 3} and ending with 322.