Exam.Code:0461
Sub. Code: 3619

2022
M.Sc. Information Technology
Third Semester
MS-69: Theory of Computation

Time allowed: 3 Hours | Max. Marks: 80

***NOTE**: Attempt five questions in all, including Question No. 9 (Section-E) which is compulsory and selecting one question each from Section A-D.*

x-x-x

SECTION A

1. (i) Discuss equivalence of DFA and NFA with an example. (8)
   (ii) Discuss (a) languages with their relations, (b) languages and automata. (8)
2. (i) Discuss each type of Grammer as Type-0, 1, 2 and 3. (8)
   (ii) Discuss Moore machine and conversion from Mealy machine to Moore machine using suitable examples. (8)

SECTION B

3. (i) For the regular languages L_1 and L_2, show that $L_1 - L_2$ is regular and regular languages are closed under closure. (8)
   (ii) Discuss construction of NFA and DFA of a regular expression. (8)
4. (i) Write regular expressions for the following language on {0,1}.
   (a) All strings containing an odd number of 0's, (b) all strings not containing the substring 011. (8)
   (ii) Discuss equivalence of two finite automata using suitable example. (8)

SECTION C

5. (i) Convert the given CFG to GNF:
   $S \rightarrow ABA,\ \ A \rightarrow aA \mid \epsilon,\ \ B \rightarrow bB \mid \epsilon$ (8)
   (ii) Discuss two context free languages are closed under union. Are these closed under intersection too? Justify. (8)
6. (i) Construct a pda that accepts the language generated by grammer with productions
   $S \rightarrow aSbb \mid a$. (8)
   (ii) Discuss procedure of conversion to CNF with example. (8)

SECTION D

7. (i) Construct a Turing machine to add two numbers. (8)
   (ii) Discuss $LR(K)$ grammer in detail. (8)
8. (i) Construct a Turing machine for multiplication of two numbers. (8)
   (ii)Discuss post correspondence machine and Church-Turing thesis. (8)

P.T.O.

SECTION - E

9. (i) Write short note on Chomsky hierarchy of languages.
   (ii) What is Arden's theorem.
   (iii) Write short note on context free grammar.
   (iv) Discuss universal turing machine. (4X4=16)

x-x-x