BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : IV**
BRANCH: IT **SESSION : SP/19**

SUBJECT: IT4025 THEORY OF COMPUTATION

TIME: 3.00 Hrs. **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Why we study Non-Deterministic Finite Automata? Give two lines justification. [2]
Q.1(b) How Finite Automat is applicable in Software Design? Explain briefly. [4]
Q.1(c) Design a Deterministic Finite Automata (DFA) to recognize strings of Σ = {a,b,c} that contain exactly one 'a' and one 'b' in its first three places. [6]

Q.2(a) In two lines write differences between two finite automata with output. [2]
Q.2(b) How a Mealy machine can be converted into a Moore machine? Explain process with suitable example. [4]
Q.2(c) Design a Mealy machine that reads a string of '0' and '1' and convert them into a string of 'a' and 'b' with following rules: [6]
i. Every second '0' will be converted into 'a'
ii. Every third '1' will be converted into 'a'
iii. Remaining all '0' and '1' will be converted into 'b'

Q.3(a) Write relation between Regular Expression and Finite Automata in two lines. [2]
Q.3(b) Design a DFA to recognize string of Σ = {0,1} that contain odd numbers of 0's and 1's. [4]
Q.3(c) From the DFA designed for answer of Q.3b, derive the corresponding Regular Expression. [6]

Q.4(a) What is the form of production in Greibach Normal Form(GNF)? [2]
Q.4(b) What are the advantages of writing grammars in GNF? [4]
Q.4(c) Design a Grammar that will generate variable declaration statement with initialization as optional. [6]

Q.5(a) Give the pictorial representation of Pushdown automata. [2]
Q.5(b) Describe the functioning of Pushdown Automata with the help of diagram produced for answer of question Q.5a [4]
Q.5(c) Design a Pushdown automata to recognize string anb2nc2md3m n,m>=1 [6]
Note: At a time only, a single symbol can be pushed or popped into/from stack.

Q.6(a) Define Parsing. [2]
Q.6(b) How pushdown Automata is helpful in designing of a Parser? Explain in brief. [4]
Q.6(c) When a Grammar is called Ambiguous? Designing of a Top down parser for Ambiguous grammar is possible. (True/False) [6]
How to remove ambiguity from an ambiguous grammar? Justify your answer with suitable example.

Q.7(a) Write the mathematical definition of Turing machine. [2]
Q.7(b) Briefly describe the Halting problem of Turing machine. [4]
Q.7(c) Design a Multi tape Turing machine to perform bitwise logical AND and logical OR operations on two input of 8-bit binary strings (string of '0' and '1'). Selection of operation will be done by checking value of a memory cell. [6]

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