Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMMUNICATION ENGINEERING)

MAKE-UP EXAMINATIONS, DECEMBER 2019

SUBJECT: PROGRAM ELECTIVE - V: NATURAL COMPUTING [ICT 4011]

REVISED CREDIT SYSTEM
(31/12/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** questions.
- Missing data, if any, may be suitably assumed.

1A. What do you mean by constraints in Genetic Algorithms? Explain by considering **5**

a) an unconstrained optimization problem of the form :
Minimize $f(x) = x^2$ and

b) a constrained problem in maximization form:
Maximize f(x) Subject to $g_i(x) \geq 0$ i = 1, 2, 3, ...n , where x is a k vector.

1B. Justify with an example whether memory is an advantage or a disadvantage of finite automata. **3**

1C. Find a regular expression for the set $\{a^n b^m : (n + m)$ is odd$\}$. **2**

2A. Explain the following with respect to a PDA. **5**

(a) Instantaneous description.
(b) Acceptance of a language.
(c) Conditions for a PDA to be non-deterministic.
(d) Data structure used.

2B. What are the three reasons for using DNA computing to solve computational problems? **3**

2C. Explain the sequence of four operations that are performed on a test tube in DNA sticker model. **2**

3A. Obtain a DFA which accepts strings of 0's and 1's where the value of each string is represented as a binary number. Only the strings representing zero modulo five should be accepted. Show all the steps in detail. **5**

3B. List and explain any 6 operations that can be performed on DNA **3**

3C. Give a CFG for the language $\{0^i1^j2^k \mid i+j \geq 2k\}$. **2**

4A. What is PCR (polymerase chain reaction)? How is PCR done? What is the purpose of doing a PCR? **5**

4B. Explain with an example any 6 operations on DNA. **3**

4C. Explain any 4 micro-operators in Genetic Algorithms **2**

5A. Obtain corresponding PDA for the following grammar. **5**

S → aABC
A → aB | a
B → bA | b
C → a

5B. What is Membrane computing? What are the main ingredients of models investigated in membrane computing area? **3**

5C. What is the Dirac notation in Quantum computing? Explain. **2**