Reg. No.											

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. (AERONAUTICAL ENGINEERING)

END SEMESTER MAKE-UP EXAMINATIONS, JUNE 2018

SUBJECT: OPTIMISATION TECHNIQUES-ELECTIVE IV [AAE 4011]

REVISED CREDIT SYSTEM
(22/06/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. What are the necessary and sufficient condition for optimality? **(02)**

1B. With a flow diagram explain the procedure for simulated annealing. **(03)**

1C. Find minimum of the function $8x\text{-}x^4$ in the interval [-2, 1] using Fibonacci method. Compute 5 iterations only. **(05)**

2A. What are the differences between bracketing methods and interval reduction method? **(02)**

2B. Find the direction orthogonal to the vector $s_1 = \left[\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right]^T$ at point $x = (0,0,0)^T$ **(03)**

2C. Compute two iterations of simplex search method for the function *minimize* $f(x) = (1-x_1)^2 + (2-x_2)^2$, $x^{(0)} = [0,0]^T, x^{(1)} = [2,0.5]^T$ *and* $x^{(2)} = [0.5,2]^T$ **(05)**

3A. What are the differences between Newton's method and secant method for single variable optimization? **(02)**

3B. Deshpande Gardening Supplies contracts, on a weekly basis, for suppliers for its stores. Clay Corner can provide 150 glazed and 400 unglazed flowerpots per week. It can commit to at most 15 weeks of production. The contract is for Rs 8000 per week. Wheel works can provide 50 glazed and 100 unglazed flowerpots per week. It can commit to at most 35 weeks of production. This contract is for Rs 4000 per week. To satisfy existing orders for spring shipment of plants, Mr. Deshpande needs at least 2250 glazed and 5000 unglazed flowerpots. Formulate the problem to minimise the cost. **(03)**

3C. Minimize $(x- 2)^2 + 2(y- 1)^2$ **(05)**
Subject to $x + 4y \le 3$ $x \ge y$ Apply Kuhn Tucker conditions

4A. Find whether the direction $s=[-1, 2]^T$, at $x=[0, 1]^T$, is descent for the function **(02)**
$f(x_1, x_2) = x_1^4 + x_2^3 - 2x_1^2x_2^2 + \frac{10x_1}{x_2^2}$

4B. Find the minimum of the following objective function by Newton's method **(03)**
$f(x_1x_2) = 8x_1^2 + 4x_1x_2 + 5x_2^2$ with initial point $\mathbf{X_0}$=[10,10]

4C. Solve the following NLP problem using Lagrange Multiplier Method. **(05)**
$\max\ f(x_1, x_2) = 2\ln x_1 + 3\ln x_2 + 3\ln x_3$
$s.t\ \ x_1 + 2x_2 + 2x_3 = 10$

5A. What are the differences between Cauchy's and Newton's search methods? **(02)**

5B. Describe genetic operators. **(03)**

5C. The function $sinx+xe^x$ has a root between -3 and -4. Compute 5 iterations of secant method to find the final interval of uncertainty.