Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. (AERONAUTICAL ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: OPTIMISATION TECHNIQUES-ELECTIVE IV [AAE 4011]

REVISED CREDIT SYSTEM
(26/04/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. State whether the following statement is true or false giving suitable reason. ”cutting plane method is an approximate method of finding an optimal solution to the constrained optimisation problem” **(02)**

1B. For the function $f(x_1, x_2) = x_1^2 + 2x_1x_2 + 2x_2^2$ at [1, 1]^T, Calculate the gradient, calculate the hessian and specify (and justify) whether the function is convex, concave or neither. **(03)**

1C Compute 4 interval reduction using Fibonacci method to find minimum of the function $f(x) = \ln^2(x-2) + \ln^2(10-x) - x^{0.2}$ in the range [6.0, 9.9] where the function is unimodal. **(05)**

2A. The Holland family decides to raise and sell peppers and tomatoes to supplement their income. They have six acres of land. They believe they can make Rs. 30,000 an acre on peppers and Rs.45,000 an acre on tomatoes. From past experience, they feel that they cannot take care of more than five acres of peppers or four acres of tomatoes. Write a mathematical model to show how many acres of each they should grow to maximize profit. **(02)**

2B. Find the shortest distance from the point [3,0] to the parabola $y=x^2$ using Lagrange multiplier method. **(03)**

2C. Compute two iterations of simplex search method for minimization of the function $f(x) = (1-x_1)^2 + (2-x_2)^2$ with starting point [0,0], [0.5,2.0], and [2.0, 0,5]. **(05)**

3A. Why do we use quadratic functions as the basis for developing non-linear optimization algorithms? **(02)**

3B. Minimise $2x^2 + \frac{16}{x}$ with starting point x_1=1 using Newton method. Compute 5 iterations only. **(03)**

3C. With the help of a 2-member truss, describe how the design problems can be addressed in optimization. Clearly mention the variables, objective function and the constraints. **(05)**

4A. Find whether the direction s=[1, 1]^T, at x=[2, 3]^T, is descent for the function $f(x_1, x_2) = 2x_1^2 + x_2^2 - 2x_1x_2 + 4$ **(02)**

4B. Describe the Strategies associated with Tabu search method **(03)**

4C. Use KKT condition to minimize x_1x_2, subject to $x_1+x_2 \geq 2$, $x_2 \geq x_1$. **(05)**

5A. What are the advantages and limitations of region elimination method in optimization? **(02)**

5B. What are the methods of selection of fitter individuals on genetic Algorithm? Explain in brief. **(03)**

5C Compute two iterations of Marquardt method to minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ from the starting point X_1= [2, 2] ^{T} with λ=100 in first iteration and 50 in second iteration. **(05)**