Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.TECH. (CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: Optimization of Chemical Processes [CHE5201]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 100

Instructions to Candidates:

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

1A.	Describe the five major steps involved in developing optimization model.	**10**
1B.	Solve the following objective function using bounding phase algorithm. Consider initial guess as -5 and increment as 0.5. Show the minimum three iteration of the algorithm. $f(x) = 2x^3 + (5x)^2$	**10**
2A.	Discuss the Necessary and sufficient conditions for the multivariable object functions.	**08**
2B.	Locate the stationary points of f(x) and classify them as relative maxima, relative minima or neither $f(x) = 2x_1^3/3 - 2x_1x_2 - 5x_1 + 2x_2^2 + 4x_2 + 5$	**12**
3A	Develop a Newton-Rapson algorithm for finding optimum value of the objective function.	**06**
3B	Solve the following objective function using Newton-Rapson algorithm. Start the algorithm with initial guess=1. Show minimum three iteration of the algorithm. $f(x) = x^2 - 54/x$	**08**
3C.	Discuss the merits and de-merits of gradient based methods over non-gradient based methods.	**06**
4A	Discuss the solution strategy using Lagrange multiplier method to solve constrained optimization problem.	**08**

4B.	A refinery process crude oils to produce a number of raw gasoline intermediates that must subsequently blended to make two grades. Each raw gasoline has a known performance rating, maximum availability and fixed cost. The optimal refinery production plan is to be determined over the next specified planning period. The above problem is simplified and formulated as linear programming problem (LPP). Solve the LPP using graphical method. $\text{Minimize} \quad z = 40x_1 + 36x_2$ $\text{subject to} \quad x_1 \le 5;\ x_2 \le 6$ $5x_1 + 3x_2 \ge 30$ $x_1 \ge 0;\ x_2 \ge 0$	**12**
5A	Solve the following linear programming problem (LPP) using simplex algorithm $\text{Maximize} \quad f(x) = x_1 + 2x_2 + x_3$ $\text{subject to} \quad 2x_1 + x_2 - x_3 \le 2$ $-2x_1 + x_2 - 5x_3 \ge -6$ $4x_1 + x_2 - x_3 \le 6$ $x_i \ge 0;\quad i = 1, 2, 3.$	**14**
5B.	Discuss the merits and de-merits of simplex algorithm over *Karmarkar's* algorithm with respect to solution of large scale linear programming problem.	**06**

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