Benha University Faculty of Engineering- Shoubra Eng. Mathematics & Physics Department Qualifying Studies (Mathematics)		Final Term Exam Date: 17 / 5 / 2014 Operations Research Duration: 3 hours
• Answer **All** questions • The Exam consists of one page		• No. of questions: 4 • Total Mark: 200

[1](a)Write the mathematical form of mathematical programming problem. Also, classify the mathematical programming problems.   **20**

(b) Write and solve the dual problem of the LP problem: **30**

minimize $f = 3x + y$

s.t $x - y \le 4,\ -x + y \le 1,\ x + y \ge 3,\quad x, y \ge 0$

[2]Solve the LP problems:

(a)maximize $f = 3x - y + 2z$

s.t $x + 2y - 2z \le 4,\ -y + 2z \le 5,\ -x + y \le 6,\quad x, y, z \ge 0$ **30**

(b) maximize $f = 5x + y + 4z$

s.t $x + y + 2z \le 20,\quad 2x + 3y + 2z = 10,\quad x + 2y + 2z \ge 6,\quad x, y, z \ge 0$ **30**

[3](a) State the definition of convex set.   **5**

(b) State the definition of convex function.   **5**

(c)Prove that: Any local solution of a convex programming problem is also global.   **20**

(d)Prove that: The minimum of a non constant function f on a convex set $G \subset R^n$ can not be attained at interior point.   **20**

[4](a) A manufacturer makes automobiles and trucks in a factory that is divided into two shops. Shop1, which performs the basic assembly operation, must work 5 man-days on each truck but only 2 man-days on each automobile. Shop 2, which performs finishing operations, must work 3 man-days on each automobile or truck that it produces. Because of men and machine limitation shop1 has 180 man-days per week available while shop 2 has 135 man-days per week. If the manufacturer makes a profit of LE 300 on each truck and LE 200 on each automobile. How many of each should he produce to maximize his profit?   **20**

(b)Solve the assignment problem: **20**

Machine

$$
\text{Job} \begin{bmatrix} 4 & 8 & 12 & 6 \\ 18 & 7 & 10 & 9 \\ 8 & 5 & 11 & 7 \\ 16 & 7 & 8 & 5 \end{bmatrix}
$$

Good Luck   *Dr. Mohamed Eid*