Benha University Faculty of Engineering- Shoubra Eng. Mathematics & Physics Department Qualifying Studies (Mathematics)		Final Term Exam Date: 26 / 5 / 2015 Operations Research EMM 406 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. 30
Also, classify the mathematical programming problems.

(b)Write the dual problem of the LP problem: 30

maximize $f = -2x + 2y$

s.t $3x + y \leq 12,\ -x + y = 6,\ x + y \geq 8,\quad x, y \geq 0$

[2]Solve the LP problems:

(a) maximize $f = 3x + y + 4z$ 30

s.t $x + y + 2z \leq 18$

$2x + 3y + 2z = 18$

$x + 2y + 2z \geq 6,\quad x, y, z \geq 0$

(b)minimize $f = -x + 3y - 3z$

s.t $2x + y - z \leq 4,\ 4x - 3y \leq 2,\ -3x + 2y + z \leq 3,\ x, y, z \geq 0$ 30

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

(b) State the definition of concave function. 5

(c)Prove that:

(i)The minimum of a strict convex function f on a convex set $\mathbf{G} \subset \mathbf{R^n}$ if exist must be unique. 20

(ii)The minimum of a non constant function f on a convex set $\mathbf{G} \subset \mathbf{R^n}$ can not be attained at interior point. 20

[4]A company makes desk organizers. The standard model requires 2 hours of the cutter time and one hour of the finisher time. The deluxe model requires one hour of the cutter time and 2 hours of the finisher time. The cutter has 104 hours of time available for this work per month, while the finisher has 76 hours of time available for work. The standard model brings a profit of LE 5 per unit, while the deluxe model brings a profit of LE 9 per unit. The company wishes to make the most profit. How much of each model should be made in each month. 30

Good Luck

Examiners Board : Dr. Mohamed Eid Dr. Kallid Elnagar Dr. Zaki Ahmed