



- Answer **All** questions
- The Exam consists of one page
- No. of questions: 4
- Total Mark: 200 Marks

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

(b) Write the mathematical model of transportation problem. 10

[2](a) Solve the LP problems: 30

(i) minimize $f = -x + 3y - 3z$
 s.t $2x + y - z \leq 4, 4x - 3y \leq 2, -3x + 2y + z \leq 3, x, y, z \geq 0$

(ii) maximize $f = 2x + y + z$ 30
 s.t $x - y + 2z \leq 3, x + 2y - 2z \leq 4, x - 2y + 3z \geq 4, x, y, z \geq 0$

(b) Write the dual problem of the LP problem: 20

maximize $f = -2x + 2y$
 s.t $3x + y \leq 12, -x + y = 6, x + y \geq 8, x, y \geq 0$

[3](a) Prove that: Any local solution of a convex programming problem is also global. 20

(b) 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. 20

[4](a) Solve the assignment problem: 20+30

		Machine			
Job	4	8	12	6	
	18	7	10	9	
	8	5	11	7	
	16	7	8	5	

		Supply				
	3	0	5	4	15	
	1	3	5	0	20	
	6	2	4	5	25	
Demand	10	15	20	15	60	