

ANSWER any **FOUR** questions. Each question carries 5 points.

Q1. (a) A retailer has stores in Dammam and Al-Khobar and has warehouses X and Y in two other cities (in Saudi Arabia). Each store requires delivery of exactly 15 refrigerators. In warehouse X there are 25 refrigerators, and in warehouse Y there are 10. The transportation costs to ship refrigerators from the warehouses to the stores are given in the following table:

	Dammam		Al-Khobar		Total
	Cost(SR)	Quantity	Cost(SR)	Quantity	
Warehouse X	15		13		
Warehouse Y	11		12		
Total					

For example, the cost to ship a refrigerator to Dammam from warehouse X is SR15. Set up a linear programming problem that will determine minimum cost.

[DO NOT SOLVE THE LPP.]

[25 pts]

(b). Find the dual of the following LPP:

[25 pts]

Minimize: $Z = 4x_1 + 5x_2 + 6x_3$,
subject to

$$x_1 - x_2 - x_3 \geq -3$$

$$x_1 - x_2 + x_3 \geq 3$$

$$x_1, x_2, x_3 \geq 0.$$

Q2. Complete the solution of the following LPP. (Indicate entering/departing variables, quotients, pivots and all eros.)

										<u>Quotients</u>
	x_1	x_2	x_3	x_4	s_1	s_2	s_3	s_4	Z	B
s_1	1	0	0	0	0	0	0	0	0	2
s_2	1	0	0	1	0	0	0	0	0	11
x_3	0	1	1	0	0	0	0	0	0	13
s_4	0	1	0	1	0	0	0	0	0	12
Z	-15	10	0	-10	0	0	0	0	1	305

Quotients

Variable	x_1	x_2	x_3	x_4	Z_{optimum}
Value					

Q3.

(a) As a hedge against inflation, an investor purchased a painting in 1990 for SR100,000. It was sold in 2000 for SR250,000. At what effective rate did the painting appreciate in value? [20 pts]

(b) What annual rate compounded continuously is equivalent to 5% compounded semiannually? [15 pts]

(c) A debt of SR7,000 due in seven years is to be repaid by a payment of SR3,000 now and a second payment at the end of five years. How much should the second payment be, if the interest rate is 6% compounded monthly? [15 points]

Q4.

- (a) A machine is purchased for SR 10,000 down payment and payments of SR500 at the end of every quarter for six years. If interest is 10% compounded quarterly, the corresponding cash price of the machine now. [25 pts]

- (b) A company wishes to lease temporary office space for a period of six months. The rental fee is SR1,500 per month, payable in advance. Suppose that the company wants to make a lump-sum payment, at the beginning of the rental period, to cover all rental fees due in the six-month period. If money is worth 30% compounded monthly, how much should the payment be? [25 pts]

Q5.

- (a) On a history exam, each of four items in one column is to be matched with exactly one of six items in another column. No item in the second column can be selected more than once. In how many ways can the matching be done? [15 pts]
- (b) A social services office has 15 new clients. The supervisor wants to assign 5 clients to each of three specific caseworkers. In how many ways can this be done? [15 pts]
- (c) In how many ways can a group of 2 men and 3 women line up for a group picture if no woman is to be at any end? [20 pts]

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