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M.B.A. DEGREE EXAMINATION, JANUARY 2006.

First Semester

BA 1603 — APPLIED OPERATIONS RESEARCH FOR MANAGEMENT

(Regulation 2005)

Time : Three hours   Maximum : 100 marks
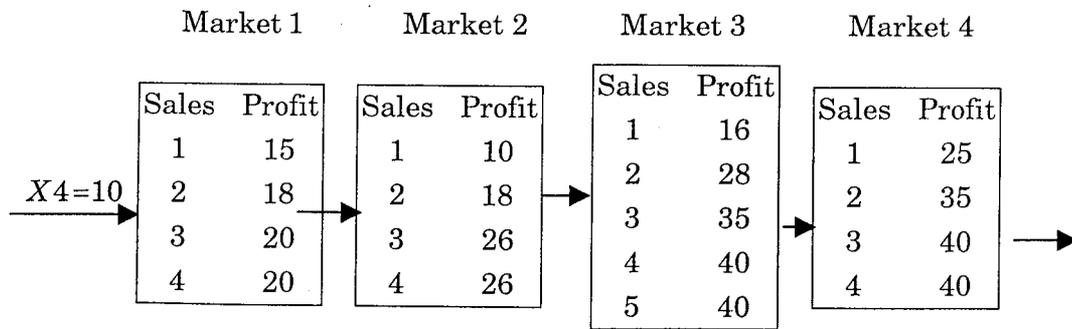
Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   What are the special cases of linear programming problem?

2.   What are the major assumptions of linear programming?

3.   What is trans-shipment problem?

4.   What is degeneracy in the transportation model?

5.   What are the classifications of linear programming?

6.   What is two person zero sum game?

7.   Define Bellman's optimality principles.

8.   Define expected monitory value?

9.   What are behaviors of the customer in a queuing model?

10. What are the basic reasons for replacement?

PART B — (5 × 16 = 80 marks)

11. A farmer has 10 horses to sell and a choice of four markets in which to sell them. Each of the markets has a different demand function (price and quantity relationship) and each has a limited demand for horses. The demand functions are given below. He must decide how many to sell at each market. So as to maximize his profit from 10 horses, solve this problem by using dynamic programming.

	Market 1		Market 2		Market 3		Market 4	
	Sales	Profit	Sales	Profit	Sales	Profit	Sales	Profit
	1	15	1	10	1	16	1	25
$X4=10$	2	18	2	18	2	28	2	35
	3	20	3	26	3	35	3	40
	4	20	4	26	4	40	4	40
					5	40		

12. (a) An electronic equipment contains 1000 resistors. When any resistor fails, it is replaced. The cost of replacing a resistor individually is Rs. 8.00. If all the resistors are replaced at the same time, the cost per resistor is Rs. 2.00. The percent surviving, S (I) at the end of month I is given below.

$$I: \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6$$

$$S\,(I): \quad 100 \quad 96 \quad 89 \quad 68 \quad 37 \quad 13 \quad 0$$

What is the optimum replacement plan?

Or

(b) Customers arrive at a one-window drive in according to a Poisson distribution with mean of 10 minutes. The service time per customer is exponential with mean of 6 minutes. The space in front of the window can accommodate only three vehicles including the serviced one. Other vehicles have to wait outside this space. Calculate

(i) Probability that an arriving customer can drive directly to the space in front of the window

(ii) Probability that an arriving customer will have to wait outside the directed space

(iii) How long is an arriving customer expected to wait before being served?

13. (a) Solve the game

Player B

Player A	19	6	7	5
	7	3	14	6
	12	8	18	4
	8	7	13	-1

Or

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(b) Find the optimum integer solution by using cutting plane method to the following problem.

Maximize $Z = X_1 + 2X_2$

Subject to

$$X_1 + X_2 < = 7, 2X_1 <= 4, 2X_2 <= 7$$

$$X_1, X_2 >= 0 \text{ and integers.}$$

14. (a) A product is manufactured by four factories A, B, C and D. The unit production cost is them are Rs. 2, Rs. 3, Rs. 1 and Rs. 5 respectively. Their production capacities are 50, 70, 30 and 50 units respectively. These factories supply the product to four stores, the demands of which are 25, 35, 105 and 20 units. Unit transportation cost, in rupees, from each factory to each store is given in the table. Determine the extent of deliveries from each of factories to each store so that the total production and transportation cost is minimum.

Stores

Factory	1	2	3	4
A	2	4	6	11
B	10	8	7	5
C	13	3	9	12
D	4	6	8	3

Or

(b) At the end of a cycle schedule a trucking firm has a surplus of one vehicle in each of the cities 1, 2, 3,4 and 5 a deficit of one vehicle in each of the cities A, B, C, D, E and F. The costs in rupees, of transportation and handling between the cities are given below. Find the assignment of surplus vehicles to deficit cities, which results in minimum total cost. Also find out which city will not receive a vehicle?

	A	B	C	D	E	F
1	134	116	167	233	194	97
2	114	195	260	166	175	130
3	129	117	48	94	66	101
4	71	156	92	143	114	136
5	97	134	125	83	142	118

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15. (a) Solve the following linear programming problem using simplex method and find the range of values for the Profit coefficient without changing the optimum solution.

Maximize $Z = 3X_1 + 5X_2$

Subject to constraints

$$X_1 + X_2 <= 1, 2X_1 + 2X_2 <= 1, X_1, X_2 >= 0.$$

Or

(b) A company during the festival season, combines two items A and B to form gift packs. Each pack must weight 5 kg. and should contain at least 2 kg. of A and not more than 4 kg. of B. The net contribution to the company is Rs. 10 per kg. of A and Rs. 12 per kg. of B. The company wants to determine the optimum mix. Formulate the above as a linear programming problem to maximize net contribution per pack and solve the same by using the simplex method.

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