Reg. No. : | | | | | | | | | | | |

Y 1615

M.B.A. DEGREE EXAMINATION, AUGUST/SEPTEMBER 2008.

Third Semester

DBA 1701 — APPLIED OPERATIONAL RESEARCH FOR MANAGEMENT

Time : Three hours Maximum : 100 marks

Graph sheet to be supplied

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Why are linear programming used widely in management decision making?

2. State the importance of dual solution in linear programming.

3. How are feasibility of the solution in transportation problem interpreted?

4. What is the test for optimality for MODI method?

5. Distinguish between pure strategy and mixed strategy.

6. How are integer programming different from mixed integer programming?

7. Define the following terms as applied to dynamic programming :

   (a) State variable

   (b) Return function.

8. List out any four typical applications of simulation technique in production management.

9. How is single channel queuing problem with exponential service, Poisson arrival from infinite population represented by Kendal notation?

10. The maintenance and repair cost of an equipment increases with time. What is the replacement policy? Neglect time value of money.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) What are the assumptions made in linear programming formulation? (6)

(ii) A company manufacturing two products, A and B requires raw material and labour. Each unit of product A requires one kg of raw material and 4 hours in production. While product B requires 2 kg of raw material and 3 hours in production. Each limit of A and B contributes Rs. 4 and Rs. 5 respectively towards profit. The available raw material and production hours are 40 kg and 120 hours for each week.

(1) Formulate the problem as linear programming model. (4)

(2) Determine optimal product mix to maximize the profit. Use graphical method. (6)

Or

(b) (i) How would you recognize multiple optimal solution in simplex method? (6)

(ii) Use the simplex method to solve the following linear programming problem : (10)

Maximize $Z = 6x_1 + 8x_2$

subject to $30x_1 + 20x_2 \leq 300$

$5x_1 + 10x_2 \leq 110$

$x_1, x_2 \geq 0.$

12. (a) A fertilizer company has three factory located at x, y, z and three central warehouse at the nodal location A, B, C. The factory can supply at 150, 175 and 275 tons respectively. While the warehouse demand at A, B, C are 200, 100 and 300 tons respectively. The unit shipping cost (Rs./unit) from factory to warehouse are shown below :

Transportation cost warehouse
(Rs./unit)

		A	B	C
	x	6	8	10
Factory	y	7	11	11
	z	4	5	12

(i) Determine the initial feasible solution and the cost. (6)

(ii) What is the optimal shipping schedule to minimize total cost? (10)

Or

(b) (i) How will you overcome degeneracy in the transportation problem ? (6)

(ii) The supply and demand for a manufacturing industry is shown below :

	Transportation cost/unit (Rs./unit)				Supply (units)
	A	B	C	D	
1	48	60	56	58	140
Factory 2	45	55	53	60	260
3	50	65	60	62	360
Demand (units)	200	320	250	210	

Determine the basic feasible solution by Vogel's (VAM) method. (10)

13. (a) A marketing company A uses two strategies while company B uses four strategies to position a product in the market. The expected market share when different strategies are used is shown below :

		Company B			
		1	2	3	4
Company A	1	70	25	45	40
	2	10	60	30	50

Determine the optimal strategy for both the companies and their expected market share. (8 + 8)

Or

(b) (i) What is the need for integer linear programming algorithms? (4)

(ii) Determine the optimum integer solution for the linear problem given below : (12)

Maximize $Z = 5x_1 + 8x_2$

$$x_1 + 2x_2 \leq 8$$
$$4x_1 + x_2 \leq 10$$
$$x_1, x_2 \geq 0 \text{ and integers}$$

14. (a) A trucker has 8 cubic meter of space available on the truck to distribute large quantities of appliance to city centre. A distributor has offered the trucker the following charges to transport as many items as the truck can accommodate.

Appliance	Charges Rs./item	Volume m^3/item
I	11	1
II	32	3
III	58	5

How many items of each appliance should the trucker accept to maximize the shipping charges without exceeding the truck available capacity? (16)

Or

(b) A research project is carried by three teams A, B, C. The management want to induct new scientist to the team. The probability that the team will not succeed when new scientist are added is shown below :

	Team		
	A	B	C
Number of New scientist 0	0.4	0.6	0.8
1	0.2	0.4	0.5
2	0.15	0.20	0.30

(i) State the dynamic recursive relation. (4)

(ii) How should the new scientist be allocated to the team? (12)

15. (a) (i) Explain the fundamental elements of queueing process. (6)

(ii) A photocopying machine is operated by the secretary in an office. The job arrives at the rate of 5 jobs/hour in a Poisson manner. Each job takes about 6 minutes to make copies and follows exponential distribution. If the time of the secretary is valued Rs. 3.50/hour, determine

(1) Average system time (5)

(2) Average cost/day. (5)

Or

(b) A large computer installation contains 2000 components of identical nature which are subject to failure as per the probability distribution :

Month end :	1	2	3	4	5
% failure :	10	25	50	80	100

Components which fail have to be replaced for the efficient functioning of the system. If they are replaced as and when occur, the cost of replacement/unit is Rs. 3. Each component which fail is replaced in group at a cost of Rs. 1.

Determine :

(i) Expected number of replacement at each month end (6)

(ii) Average cost of group replacement (6)

(iii) Whether group replacement or individual replacement is better. (4)
