

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**Question Paper Code : 85515**

M.B.A. DEGREE EXAMINATION, FEBRUARY 2012.

Third Semester

DBA 1701 — APPLIED OPERATIONAL RESEARCH FOR MANAGEMENT

(Regulation 2007/2009)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List some of the applications of O.R. in manufacturing.
2. Express the following LPP in the standard form :  
Minimize  $z = x_1 - 2x_2 + x_3$   
Subject to :  
 $2x_1 + 3x_2 + 4x_3 \geq -4$   
 $3x_1 + 5x_2 + 2x_3 \geq 7$   
and  $x_1, x_2 \geq 0$  and  $x_3$  is unrestricted.
3. What is basic feasible solution in transportation problems?
4. How will you resolve degeneracy during solution stage in transportation problems?
5. What are the applications of integer programming?
6. What are the basic assumptions of the game?
7. Define 'state' in dynamic programming.
8. What are the limitations of simulation?
9. What is 'collusion' in queue discipline?
10. What is group replacement policy?

PART B — (5 × 16 = 80 marks)

11. (a) A firm manufactures two products  $A$  and  $B$  on which the profits earned per unit are Rs. 3 and Rs. 4, respectively. Each product is processed on two machines  $M_1$  and  $M_2$ . Product  $A$  requires one minute of processing time on  $M_1$  and two minutes of processing on  $M_2$  while processing of product  $B$  requires one minute on  $M_1$  and one minute on  $M_2$ . Machine  $M_1$  is available for not more than 7 hours 30 minutes while machine  $M_2$  is available for 10 hours during any working day. Find the number of units of products  $A$  and  $B$  need to be manufactured to get maximum profit. Formulate the above LPP and solve by graphical method.

Or

- (b) Use Big-M method and solve the following simplex problem :

$$\text{Minimize } z = 4x_1 + 3x_2$$

Subject to :

$$2x_1 + x_2 \geq 10$$

$$-3x_1 + 2x_2 \leq 6$$

$$x_1 + x_2 \geq 6$$

$$\text{and } x_1, x_2 \geq 0.$$

12. (a) Solve the following transportation problem using VAM method and maximize the profit.

Source	Destinations				Supply
	A	B	C	D	
1	40	25	22	33	100
2	44	35	30	30	30
3	38	38	28	30	70
Demand	40	20	60	30	

Or

- (b) A product is produced by four factories  $F_1, F_2, F_3$  and  $F_4$ . Their unit production cost are Rs. 2, 3, 1 and 5 respectively. Production capacity of the factories are 50, 70, 30 and 50 units, respectively. The product is supplied to four stores  $S_1, S_2, S_3$  and  $S_4$  the requirements of which are

25, 35, 105 and 20, respectively. Unit cost of transportation are given in the following table. Find the transportation plan such that the total production and transportation cost is minimum.

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>
F <sub>1</sub>	2	4	6	11
F <sub>2</sub>	10	8	7	5
F <sub>3</sub>	13	3	9	12
F <sub>4</sub>	4	6	8	3

13. (a) Use branch and bound technique to solve the following integer programming problem :

$$\text{Maximize } z = 7x_1 + 9x_2$$

Subject to :

$$-x_1 + 3x_2 \leq 6$$

$$7x_1 + x_2 \leq 35$$

$$x_1 \geq 0$$

$$x_2 \leq 7$$

and  $x_1, x_2$  are integer.

Or

- (b) Use dominance property and solve the following game and also find the value of the game.

		Player B		
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>
Player A	A <sub>1</sub>	1	7	2
	A <sub>2</sub>	6	2	7
	A <sub>3</sub>	5	1	6

14. (a) A student has to take examination in three courses X, Y, Z. He has three days available for study. He feels it would be best to devote a whole day to study the same course, so that he may study a course for one day, two days or three days or not at all. His estimates of grades he may get by studying are as follows :

Study days/course	X	Y	Z
0	1	2	1
1	2	2	2
2	2	4	4
3	4	5	4

How should he plan to study so that he maximizes the sum of his grades?

Or

- (b) An ice-cream retailer buys ice-cream at a cost of Rs. 5 per cup and sells it for Rs. 8 per cup; any ice-cream remaining unsold at the end of the day can be disposed off at a salvage price of Rs. 2 per cup. Past sales have ranged between 15 and 18 cups per day; There is no reason to believe that sales volume will take on any other magnitude in future. Find the EVPI, if the sale history has the following probabilities.

Market size	15	16	17	18
Probability	0.10	0.20	0.40	0.30

15. (a) On an average 96 patients per 24-hour day require the service of an emergency clinic. Also, on an average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs. 100 per patient treated to obtain an average servicing time of 10 minutes, and that each minute of decrease in this average time would cost Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from 1.33 patients to 0.5 patient?

Or

- (b) There are a large number of electric bulbs, all of which must be kept in working order. If an electric bulb fails in service, its costs Rs. 1 to replace it, but if all the electric bulbs are replaced in the same operation, it costs only 35 paise an electric bulb. If the proportion of bulbs failing in successive time intervals is known, decide on the best replacement policy and give reasons. The following mortality rates for light bulbs have been observed :

Proportion failing during first week = 0.09

Proportion failing during second week = 0.16

Proportion failing during third week = 0.24

Proportion failing during fourth week = 0.36

Proportion failing during fifth week = 0.12

Proportion failing during sixth week = 0.03.