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Question Paper Code : 40340

M.B.A. DEGREE EXAMINATION, APRIL/MAY 2015.

Second Semester

BA 7206 — APPLIED OPERATIONS RESEARCH

(Regulation 2013)



Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the limitation of a graphical method.
2. How does dual simplex method differ from simplex method?
3. What is an unbalanced transportation problem?
4. Which cell will be the first basic variable in case of North West Corner Method and Least Cost Method?
5. While using IPP technique, what is the fractional part of $-\frac{98}{19}$?
6. Differentiate between pure and mixed strategies.
7. List the elements of carrying cost.
8. What do the terms 'uncertainty' and 'risk' refer?
9. In a store with one cashier, nine customers arrive on the average of every five minutes and the cashier can serve them ten in five minutes. Find utilization factor.
10. If the money carries an interest rate of 10% per year, what will be the value of one rupee after two years?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Solve the following LPP graphically ;
Minimize $Z = 3x + 2y$;
Subject to $x - y \leq 1$, $x + y \geq 3$ and $x, y \geq 0$. (8)
- (ii) A person wants to decide the constituents of a diet which will fulfil his daily requirements of proteins, fat and carbohydrates at the minimum cost. The choice is to be made from four different types of foods. The yields per unit of these foods are given below :

Food type	Yield per unit			Cost per unit
	Proteins	Fats	Carbohydrates	
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum requirement	800	200	700	

Formulate the LPP for the problem.

Or

- (b) Solve the following LPP Two phase simplex method;

$$\text{Maximize } Z = -4a - 3b - 9c;$$

$$\text{Subject to } 2a + 4b + 6c \geq 15$$

$$6a + b + 6c \geq 12$$

$$a, b, c \geq 0$$

12. (a) Solve the following transportation problem to minimize the total transportation cost for shifting the goods from factories (A, B and C) to warehouses (P, Q and R) where unit transportation cost, availability and demand at factories and warehouses respectively are given in the following matrix ; (16)

	Ware House			Availability
	P	Q	R	
Factory A	1	2	0	30
Factory B	2	3	4	35
Factory C	1	5	6	35
Demand	30	40	30	

Find the allocation so that the total transportation cost is minimum.

Or

- (b) A company has 4 territories and four salesmen for assignment. The territories are not equally rich in their sales potential. It is estimated that a typical salesman operating in each territory would bring the following annual sales. (16)

Territory :	I	II	III	IV
Annual sales in Rs. :	60,000	50,000	40,000	30,000

The four salesmen are also considered to differ in their ability; it is estimated that working under same condition, their yearly sales would be proportionately as follows ;

Salesman :	A	B	C	D
Proportion :	0.1	0.2	0.3	0.4

If the criteria is to maximize expected sales, what is your intuitive answer and verify your answer with Hungarian method.

13. (a) Find the optimum integer solution to the following LPP; (16)

$$\text{Maximize } Z = 3x_1 + 7x_2$$

$$\text{Subject to } 3x_1 + 4x_2 \leq 19$$

$$3x_1 + 6x_2 \leq 21$$

x_1, x_2 non-negative integers

Or

- (b) (i) State the rules of dominance. (4)

- (ii) Solve the following game; (12)

	Player B		
Player A	1	7	2
	6	2	7
	5	1	6

14. (a) (i) Derive EOQ formula for simple inventory model with no shortages and instantaneous replenishment. (6)

- (ii) Find the optimum order quantity for a product for which the price break is given below;

QUANTITY	UNIT COST (in Rs.)
$0 \leq q_1 < 100$	Rs. 20 per unit
$100 \leq q_2 < 200$	Rs. 18 per unit
$200 \leq q_3$	Rs. 16 per unit

The monthly demand for the product is 400 units. The storage cost is 20% of the unit cost of the product and the cost of ordering is Rs.25. (10)

Or

- (b) Concisely explain the criterions used to assist decision making under uncertainty. (16)

15. (a) (i) A TV repairman finds that the time he spent on his job has an exponential distribution with mean 30 minutes. If he repairs the set in the order it arrives, and the arrival rate is approximately Poisson, with an average rate of 10 per 8 hour day, what is the expected idle time of repairman each day? How many jobs are ahead of average before the job just brought in? (4)

- (ii) A telephone exchange has two long distance operators. The telephone company finds that during the peak load long distance calls arrive in a Poisson fashion at an average rate of 15 per hour. The length of service on these calls is approximately distributed with mean 5 minutes.

- (1) What is the probability that subscriber will have to wait for his long distance call during the peak hours of the day?

- (2) If the subscriber will wait and be serviced in turn, what is the expected waiting time in queue? (12)

Or

- (b) A machine costs Rs. 15,000 and its running costs for different years are given below. Find optimum replacement period if the capital is worth 10% and the machine has no salvage value. (16)

Year :	1	2	3	4	5	6	7
Running cost Rs. :	2500	3000	4000	5000	6500	8000	10000



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