

**Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore – 641 043**

Master's Degree Examination – November 2017

III-Semester

Class : II PG

**Major : Business Administration /
M.B.A. – IT Organisation Administration**

**Max. Marks: 60
Time: 3 hours**

16pBM004

16MBAC18 / 16MBMC18 APPLIED OPERATION RESEARCH

PART A

[10x1/2 =5 MARKS]

CHOOSE THE CORRECT ANSWER:

1. Minimization of objective function in LPP means
 (a) Least value chosen among the allowable decisions
 (b) Greatest value chosen among the allowable decisions
 (c) Both (a) and (b) (d) none of the above
2. Dual simplex method is applicable to these LPP's that start with
 (a) an infeasible solution (b) an infeasible but optimum solution
 (c) a feasible solution. (d) a feasible and optimum solution
3. The solution to a transportation problem with m-resources and n-destinations is feasible, if the number of allocations are
 (a) $m+n-1$ (b) $m+n+1$ (c) $m+n$ (d) $m \times n$.
4. In an assignment problem involving four workers and three jobs, total number of assignments possible are
 (a) 4 (b) 3 (c) 7 (d) 12
5. Which of the following is not used for decision making under uncertainty?
 (a) minimax criterion (b) maximax criterion
 (c) minimize expected loss criterion (d) maximin criterion
6. The slack for an activity in network, is equal to
 (a) LS-ES (b) LF-LS (c) EF-ES (d) EF-LS
7. Multiple servers may be
 (a) In parallel (b) In series (c) In combination of parallel
 (d) All of the above
8. The problem of replacement is not concerned about the
 (a) items that deteriorate graphically
 (b) items that fail suddenly
 (c) determination of optimum replacement interval
 (d) maintenance of an item to work out profitability
9. As simulation is not an analytical model, therefore, result of simulation must be viewed as
 (a) approximation (b) exact (c) unrealistic (d) simplified
10. Dynamic programming problem
 (a) cannot be dealt with non-linear constraints (b) can be solved by simplex method
 (c) is solved starting from the initial stage to the next till the final stage is reached
 (d) can be solved by using Monte – Carlo method.

Part B – [5x4=20 Marks]
Answer ALL the questions.

11. (a) Account for the growing importance of O.R in business decisions.

(Or)

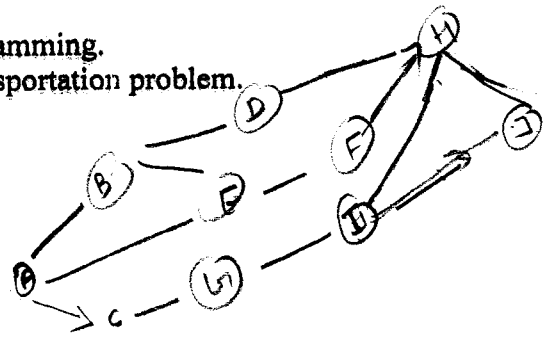
(b) Give the general form of a basic model of linear programming.

12. (a) Explain the steps involved in finding solution to a transportation problem.

(Or)

(b) Solve the following assignment problem:

	A	B	C	D
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5



13. (a) Draw a network diagram for the following data:

Activity:	A	B	C	D	E	F	G	H	I	J
Preceding activities:	none	A	A	B	A	B, E	C	D, F	G	H, I

(Or)

(b) Explain about decision making under conditions of uncertainty.

14. (a) What are the basic characteristics of a queuing system?

(Or)

(b) Explain the concept of replacement theory.

15. (a) What are the important applications of simulation?

(Or)

(b) Discuss the concept of Dynamic Programming.

Part C

[5x7=35 Marks]

Answer ALL the questions.

Question No. 20 is Compulsory

16. (a) An aeroplane can carry a maximum of 200 passengers. A profit of Rs.400 is made on each first class ticket and a profit of Rs.300 is made on each economy class ticket. The airline reserves at least 20 tickets for first class seats. However, at least 4 times as many passengers prefer to travel by economy class as to the first class. Determine how many tickets of each type must be sold in order to maximise the total profit for the airline.

Formulate a linear programming model to determine the optimal mix that will maximise profit. Solve it by graphical method.

(Or)

(b) Briefly explain the important applications of operational research.

17. (a) ABC Ltd has three production shops supplying a product to five warehouses. The cost of production varies from shop to shop and cost of transportation from one shop to a warehouse also varies. Each shop has a specific production capacity and each warehouse has certain amount of requirement. The cost of transportation are as given below.

Shop	Warehouse					Supply
	I	II	III	IV	V	
A	6	4	4	7	5	100
B	5	6	7	4	8	125
C	3	4	6	3	4	175
Demand	60	80	85	105	70	400

The cost of manufacture of the product at different production shops is

Shop	Variable cost	Fixed cost
A	14	7,000
B	16	4,000
C	15	5,000

Find the optimum quantity to be supplied from each shop to different warehouses at minimum total cost.

(Or)

(b) Consider the problem of assigning five operators to five machines. The assignment costs are given below.

Operators	A	B	C	D	E
I	10	3	10	7	7
II	5	9	7	11	9
III	13	18	2	9	10
IV	15	3	2	7	4
V	16	6	2	12	12

Assign the operators to different machines so that total cost is minimised.

18. (a) A small maintenance project consists of the following 10 jobs whose precedence relationships are identified by their node numbers.

Job	Node numbers	Estimated duration(days)	Job	Node numbers	Estimated duration(days)
a	(1,2)	2	f	(4,6)	6
b	(2,3)	3	g	(4,7)	2
c	(2,4)	5	h	(5,8)	8
d	(3,5)	4	i	(6,8)	7
e	(3,6)	1	j	(7,8)	4

- (i) Draw an arrow diagram representing the project.
- (ii) Calculate early and late start and finish times for each job.
- (iii) Which jobs are critical?
- (iv) How much slack does job (3, 5) have?

(Or)

(b) A wholesaler of sports goods has an opportunity to buy 5,000 pairs of skis that have been declared surplus by the government. The wholesaler will pay Rs.50 per pair and can obtain Rs.100 a pair by selling skis to retailers. The price is well-established, but the wholesaler is in doubt as to just how many pairs he will be able to sell. Any skis left over, he can sell to discount outlets at Rs.20 a pair. After a careful consideration of the historical data, the wholesaler assigns probabilities to the demand as follows:

Retailer's demand	Probability
1,000 pairs	0.6
3,000 pairs	0.3
5,000 pairs	0.1

- (1) Compute the conditional monetary and expected monetary values.
- (2) Compute the expected profit with a perfect predicting device.
- (3) Compute the EVPI.

19. (a) The repair of a Lathe requires four steps to be completed one after another in a certain order. The time taken to perform each step follows exponential distribution with a mean of 5 minutes and is independent of other steps. Machine breakdown follows Poisson process with mean rate of 2 breakdowns per hour. Answer the following.

- (i) What is the expected idle time of the machine, assuming there is only one repairman available in the workshop?
- (ii) What is the average waiting time of a breakdown machine in the queue?
- (iii) What is the expected number of broken down machines in the queue?

(Or)

B
A
C
D
E
1/5/15/1

(b) The automobile company manufactures around 150 scooters. The daily production varies from 146 to 154 depending upon the availability of raw materials and other working conditions:

Production (per day):	146	147	148	149	150	151	152	153	154
Probability	0.04	0.09	0.12	0.14	0.11	0.10	0.20	0.12	0.08

The finished scooters are transported in a specially arranged lorry accommodating 150 scooters. Using the following random numbers:

80, 81, 76, 75, 64, 43, 18, 26, 10, 12, 65, 68, 69, 61, 57

Simulate the process to find out:

- (i) What will be the average number of scooters waiting in the factory?
- (ii) What will be the average number of empty space on the lorry?

20. Compulsory:

Use simplex method to

$$\text{Maximize } z = 2x_1 + 4x_2 + x_3 + x_4$$

Subject to the constraints:

$$x_1 + 3x_2 + x_4 \leq 4$$

$$2x_1 + x_2 \leq 3$$

$$x_2 + 4x_3 + x_4 \leq 3$$

$$x_1, x_2, x_3, x_4 \geq 0$$
