



# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

## B.C.A. DEGREE EXAMINATION – COMPUTER APPLICATIONS

FIRST SEMESTER – NOVEMBER 2017

### 17/16UCS1AL01 - OPERATION RESEARCH

Date: 13-11-2017  
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

#### SECTION-A

ANSWER ALL THE QUESTIONS:

(10X2=20)

1. Define Operations Research.
2. What are the limitations of graphical method?
3. Write down the conditions for solving the transportation problem.
4. Write down the condition for solving assignment problem
5. State job sequencing problem.
6. What is idle time?
7. Define critical path.
8. What does PERT stand for? What is the objective of PERT?
9. Define Inventory.
10. What is setup cost?

#### SECTION-B

ANSWER ALL THE QUESTIONS:

(5X8=40)

11. a) A company manufactures two products A and B in two departments namely assembly department and painting department. It takes two hours in the assembling department and one hour in painting department to manufacture one unit of product A. It takes two hours in the assembling department and 2 hours in painting department for manufacturing one unit of product B. The assembling department works for three 8 hours shift per day and painting department works two 8 hours shift per day. The profit of the product A is Rs.100 and the profit of the product B is Rs.150 per unit. How many units of product A and B to be manufactured so as to maximize the profit for the company?

(OR)

b) Solve the following LPP by Graphical method:

Max  $Z = 3x_1 + 4x_2$  Subject to the constraints:

$$x_1 + x_2 \leq 450, \quad 2x_1 + x_2 \leq 600, \quad x_1, x_2 \geq 0$$

12. a) Obtain an initial basic feasible solution to the following transportation Problem using North-West Corner Rule.

	D	E	F	G	Available
A	6	8	8	5	30
B	5	11	9	7	40
C	8	9	7	13	50
Requirements	35	28	32	25	

(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) Find the sequence that minimizes the total elapsed time (in Hrs) required to complete the following task on 2 machine.

Jobs	J1	J2	J3	J4	J5	J6
Machine A	1	3	8	5	6	3
Machine B	5	6	3	2	2	10

(OR)

b) The maintenance cost and the resale price of a truck are given below.

Year	1	2	3	4	5	6	7	8
Maintenance Cost	1000	1300	1700	2200	2900	3800	4800	6000
Resale Price	4000	2000	1200	600	500	400	400	400

The purchase price of the truck is Rs.8000. Determine the time at which it is profitable to replace the truck.

14. a) Write down the differences between PERT & CPM.

(OR)

b) A is the first operation on the project. B&C can be done concurrently & both must follow A. B must proceed D. E can not begin until both B&C are completed. F is dependent on the completion of both D&E. F is the last operation on the project. Draw the arrow network and number the nodes.

15.a) Explain the various cost associated with Inventory.

(OR)

b) A particular item has a demand of 9,000 units/year. The cost of one procurement is Rs.100 and the holding cost per unit is Rs.2.40 per year. The replacement is instantaneous and no shortages are allowed. Determine

- (i) The economic lot size,
- (ii) The number of orders per year,
- (iii) The time between orders,
- (iv) The total cost per year if the cost of one unit is Re.1.

### SECTION-C

ANSWER ANY TWO QUESTIONS:

(2X20=40)

16. i) Solve by Simplex method :

(10)

Max  $Z = 4x_1 + 10x_2$  Subject to the constraints:

$$\begin{array}{rcl} 2x_1 + x_2 & = & 50 \\ 2x_1 + 5x_2 & = & 100 \\ 2x_1 + 3x_2 & = & 90 \\ x_1, x_2 & \geq & 0 \end{array}$$

ii) A firm has 3 factories producing certain product and it is to be transported to five distribution centers. The unit transportation cost (in 100's of Rupees) from factories to the distribution center are given below.

		Distribution Centers				
Factories		D1	D2	D3	D4	D5
	F1	3	2	3	4	1
	F2	4	1	2	4	2
	F3	1	0	5	3	2

Total productions of F1, F2 & F3 are 100, 125, 75 and the demands of distribution centers D1, D2, D3, D4 & D5 are 100, 60, 40, 75, 25 units respectively. Determine the transportation pattern to minimize the overall shipping cost. (Using VAM) **(10)**

17. i) Find the sequence that minimizes the total elapsed time (in Hrs) required to complete the following task on 2 machines. Also calculate total elapsed time and idle time of each machine. **(10)**

Tasks	A	B	C	D	E	F	G	H	I
Machine 1	2	5	4	9	6	8	7	5	4
Machine 2	6	8	7	4	3	9	3	8	11

ii) Given the following information:

Activity	1-2	1-3	2-3	2-4	2-5	3-4	4-7	5-6	5-7	6-7
a	3	1	6	0	2	3	6	1	2	4
m	4	2	8	0	5	5	9	1	5	8
b	5	3	10	0	8	7	12	1	8	12

- i) Draw the Project Network
- ii) Find the length and variance of each activity.
- iii) Find the critical path.
- iv) Find the length and variance of the critical path. **(10)**

18. (i) Define the following Terms:

- a) Reorder Level
- b) Reorder Point **(10)**
- c) Safety stock
- d) Shortage

(ii) The annual demand for an item is 3200 units. The unit cost is Rs.6/- and inventory carrying charges 25% per annum. If the cost of one procurement is Rs.150/- determine the following (i) Economic order quantity (ii) time between two consecutive orders (iii) number of order per year (iv) the optimal total cost. **(10)**

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