



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – COMPUTER SCIENCE

FIFTH SEMESTER – NOVEMBER 2017

CS 5402 - OPERATIONS RESEARCH

Date: 13-11-2017
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

SECTION-A

ANSWER ALL THE QUESTIONS:

(10X2=20)

1. Define Operation Research.
2. Write a note on slack and surplus variables.
3. When is transportation problem said to be unbalanced? Give an example.
4. State job sequencing problem.
5. Write down the route condition for the traveling salesman problem.
6. What is total elapsed time?
7. What is the objective of CPM?
8. Define dummy Activity
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 $Z = 3x_1 + 5x_2$ Subject to the constraints:

$$x_1 + 2x_2 \leq 2000, \quad x_1 + x_2 \leq 1500, \quad x_2 \leq 600, \quad x_1, x_2 \geq 0$$

12. a) Obtain an initial basic feasible solution to the following transportation Problem using Least cost method.

	D	E	F	G	Available
A	1	2	3	4	6
B	4	3	2	0	8
C	0	2	2	1	10
Requirements	4	6	8	6	

(OR)

b) Solve the following Traveling salesman problem.

	A	B	C	D	E
A	-	4	7	3	4
B	4	-	6	3	4
C	7	6	-	7	5
D	3	3	7	-	7
E	4	4	5	7	-

13. a) 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

(OR)

b) Find the sequence that minimizes the total elapsed time (in Hrs) required to complete the following task on 2 machines. Also find the total elapsed time and idle time of each machine.

Jobs	J1	J2	J3	J4	J5	J6
Machine A	3	12	5	2	9	11
Machine B	8	10	9	6	3	1

14. a) A is the 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 according to Fulkerson's Rule.

(OR)

b) Write down the difference between PERT & CPM.

15. a) Find the optimum order quantity for a product for which the price breaks are as follows:

Quantity	Purchasing cost per unit
0 Q1 < 100	20
100 Q2 < 200	18
200 Q3	16

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 per month.

(OR)

b) A stockiest has to supply 12,000 units of a product per year to his customer. The demand is fixed and known and the shortage cost is assumed to be infinite. The inventory holding cost is Re.0.20 per unit per month and the ordering cost per order is Rs.350. Determine the following

- (i) The optimum lot size q_0
- (ii) Optimum scheduling period t_0
- (iii) Minimum total variable yearly cost.

SECTION-C

ANSWER ANY TWO QUESTIONS:

(2X20=40)

16. i) Solve by Simplex method : **(10)**

Max $Z = 3x_1 + 2x_2 + 5x_3$ Subject to the constraints:
 $x_1 + 2x_2 + x_3 \leq 430, 3x_1 + 2x_3 \leq 460, x_1 + 4x_2 \leq 420, x_1, x_2 \geq 0$

ii) A steel firm has 4 plants which purchase coal for their production from 3 mines. The cost of shipping (in 100's of RS.) one ton of coal from each mine to each plant are given below:

		Plants				Capacity
		P1	P2	P3	P4	
Mines	M1	3	1	4	5	50
	M2	7	3	8	6	50
	M3	2	3	9	2	75
Requirements		40	55	60	20	

How much coal should the firm purchase from each mine in order to satisfy the demand of the plants at minimal shipping expenses.(Using Matrix minimum method) **(10)**

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

Jobs	J1	J2	J3	J4	J5	J6
Machine A	3	12	5	2	9	11
Machine B	8	10	9	6	3	1

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 quality (ii) time between two consecutive orders (iii) number of order per year (iv) the optimal total cost.

(10)

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