

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – COMPUTER SCIENCE

FIFTH SEMESTER – NOVEMBER 2009

CS 5402 - OPERATIONS RESEARCH

Date & Time: 10/11/2009 / 9:00 - 12:00 Dept. No.

Max. : 100 Marks

SECTION-A

ANSWER ALL THE QUESTIONS:

(10X2=20)

1. Write a note on slack and surplus variables.
2. What are basic feasible solution and the unbounded solution?
3. When is transportation problem said to be unbalanced? Give an example.
4. What is no passing rule?
5. Write down the route condition for the traveling salesman problem.
6. What is idle time?
7. What does PERT stand for? What is the objective of PERT?
8. Define dummy Activity
9. Define Inventory.
10. What is setup cost?

SECTION-B

ANSWER ALL THE QUESTIONS:

(5X8=40)

11. a) A company has three operational departments (weaving, processing and Packing) with capacity to produce three different types of clothes namely suiting, shirting and woolens yielding a profit of Rs.2, Rs.4 and Rs.3 per metre respectively. One metre of suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minute in packing. Similarly one metre of shirting requires 4 minutes in weaving, 1 minute in processing and 3 minutes in packing. One metre of woolen requires 3 minutes in each department. In a week total run time of each department is 60,40 and 80 hours for weaving, processing and packing respectively. Formulate the linear programming problem to find the product mix to maximize the profit.

(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 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 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) A marketing manager has 5 salesmen and 5 sales districts. Considering the capabilities of the salesman and the nature of districts, the marketing manager estimates that sales per month (in hundred rupees) for each salesman in each district would be as follows:

Salesman	Sales District				
	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

What is the maximum sales that may be expected if an optimum assignment is made?
(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
$0 \leq Q1 < 100$	20
$100 \leq Q2 < 200$	18
$200 \leq Q3$	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:

$$\begin{aligned} x_1 + 2x_2 + x_3 &\leq 430 \\ 3x_1 + 2x_3 &\leq 460 \\ x_1 + 4x_2 &\leq 420 \\ x_1, x_2 &\geq 0 \end{aligned}$$

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.

Factories	Distribution Centers					
		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) A Readymade garments manufacturer has to process 7 items through three stages of production namely cutting, sewing & packing. The times taken for each of these at the different stages are given below in the appropriate units.

Processing Time	Item	1	2	3	4	5	6	7
	Cutting	5	7	3	4	6	7	12
	Sewing	2	6	7	5	9	5	8
	Packing	10	12	11	13	12	10	11

Find an order in which these items are to be processed, so as to minimize the time taken to process all the items through all the three stages. Also find the total elapsed time and idle time of each machine. **(10)**

ii) A small Project consisting of 13 activities have the following information regarding duration of the various activities. **(10)**

Operations	Durations
1,2	8
1,3	5
1,5	7
2,4	3
2,5	5
2,6	12
3,4	0
3,8	9
4,6	7
5,6	4
5,7	2
6,7	6
7,8	10

- Draw the CPM Network
- Find the critical path.
- Calculate Earliest Start Time , Earliest Finish Time , Latest Start Time , Latest Finish Time and Total Float.

18. (i) Define the following Terms:

- Reorder Level
- Safety stock

- Reorder Point
- Shortage

(10)

(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)**
