LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc.DEGREE EXAMINATION – **COMPUTER SCIENCE**

FIFTHSEMESTER – APRIL 2018

CS 5402- OPERATIONS RESEARCH

Date: 10-05-2018
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

SECTION-A

ANSWER ALL THE QUESTIONS: **(10X2=20)**

1. Define OR.

2. Write a note on slack and surplus variables.

3. Write down the conditions for solving the transportation problem.

4. Write down the condition for solving Assignment problem.

5. Write down the route condition for the traveling salesman 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 carrying cost?

SECTION-B

ANSWER ALL THE QUESTIONS: **(5X8=40)**

11. a) A firm produces three products. These products are proposed on three different machines. The time required manufacturing one unit of each of the three products and the daily capacity of the three machines are given below.

Machines	Time per unit (minutes)			Machine capacity(minutes/day)
	Product1	Product2	Product3	
M1	2	3	2	440
M2	4	-	3	470
M3	2	5	-	430

It is required to determine the daily number of units to be manufactured for each product. The profit per unit for product 1, 2 and 3 is Rs.4 , Rs.3 , and Rs. 6 respectively. It is assumed that all the amounts produced are consumed in the market. Formulate the mathematical LPP model that will maximize the daily profit.

(OR)

b) Solve the following LPP by Graphical method:

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

$$2x_1 + x_2 \leq 40$$
$$2x_1 + 5x_2 \leq 180$$
$$x_1, x_2 \geq 0$$

12. a) Obtain an initial basic feasible solution to the following transportation
        Problem using the north-west corner rule.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirements	200	225	275	250	

(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) 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 machine.

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

14. a) Define the following Terms:
    i) Activity   ii) Event
    iii) Network   iv) Dummy Activity

(OR)

b) A is the operation on the project. B&C can be done concurrently & both must follow A.
   B must proceed D. Ecan 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.

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

(OR)

b) An automobile manufacturer purchases 2,400 casting over a period of 360 days. This
requirement is fixed and known. The castings are subject to quantity discounts.
    Determine the optimal purchase quantity and if

$$K11 = Rs.1,000 \qquad\qquad 0 < q < 4,000$$
$$K12 = Rs. 950 \qquad\qquad q \geq 4,000$$

Cost of ordering C_3 =Rs.70,000

Cost of shortage C_1 = Rs.0.12% of the unit cost.

ANSWER ANY TWO QUESTIONS: **(2X20=40)**

16. i) Solve the following LPP by Graphical method:

Max $Z = 3x_1 + 5 x_2$ Subject to the constraints:

$x_1 + 2x_2 \leq 2000$, $x_1 + x_2 \leq 1500$, $x_2 \leq 600$, $x_1, x_2 \geq 0$ **(10)**

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				
		D1	D2	D3	D4	D5
Factories	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 Least Cost Method)   **(10)**

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

(10)

Task	J1	J2	J3	J4	J5	J6	J7
Machine A	5	7	3	4	6	7	12
Machine B	2	6	7	5	9	5	8

ii) Given the following information:

Activity	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
a	3	2	6	2	5	3	3	1	4
m	6	5	12	5	11	6	9	4	19
b	15	14	30	8	17	15	27	7	28

a)   Draw the Project Network
b)   Find the length and variance of each activity.
c)   Find the critical path.
d)   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) 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 is 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. **(10)**

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