LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

U.G. DEGREE EXAMINATION – ALLIED
FIRST SEMESTER – NOVEMBER 2019
17/18UCS1AL01 – OPERATION RESEARCH

Date: 05-11-2019   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

SECTION-A

ANSWER ALL THE QUESTIONS: (10X2=20)

1. Define Operations Research.

2. What is slack variable?

3. When transportation problem said to be unbalanced?

4. Write down the route condition for travelling salesman problem

5. What is total elapsed time?

6. What is idle time?

7. Define dummy activity.

8. Define total float.

9. What is inventory?

10. What is holding 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 = $3x_1 + 5x_2$ Subject to the constraints:

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

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) 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?

13. a) 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.

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

(OR)

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

Year	1	2	3	4	5	6	7	8
Maitenance 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) Draw the network diagram for the following set of activities

Activity	A	B	C	D	E	F	G	H	I
Immediate Predecessor	-	-	-	A	B,C	A	C	D,E,F	D

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

(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 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.

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:

$$x_1 + 2x_2 + x_3 \quad 430$$
$$3x_1 + 2x_3 \quad 460$$
$$x_1 + 4x_2 \quad 420$$
$$x_1, x_2 \quad 0$$

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 **optimal** minimum shipping expenses? (Using VAM method) **(10)**

17 (i) A Readymade garments manufacturer has to process 7 items through two stages of

production namely cutting & sewing. The times taken for each of these at the

different stages are given below in the appropriate units.

Processing	Item	1	2	3	4	5	6	7
Time	Cutting	5	7	3	4	6	7	12
	Sewing	2	6	7	5	9	5	8

Find an order in which these items are to be processed through these stages, So as

to minimize the total processing time and also calculate total elapsed time, idle

time of each machine. **(10)**

 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 10000 units. The ordering cost is Rs.10. The cost of the item is Rs.20.

The holding cost is 20% of the value of the inventory per year. If the shortage cost is 25% of the value

per unit per year find the EOQ and the optimal annual inventory cost.

(10)

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