

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034****B.C.A. DEGREE EXAMINATION – COMPUTER APPLICATIONS****FIRST SEMESTER – APRIL 2023****UCS 1301 – OPERATIONS RESEARCH**

Date: 08-05-2023

Dept. No. 

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

**SECTION A****Answer ALL the Questions**

<b>1. Answer the following.</b>	<b>(5 x 1 = 5)</b>	
a) Define Linear Programming.	K1	CO1
b) State unbalanced transportation problem	K1	CO1
c) Define Sequencing Problem.	K1	CO1
d) Define dummy activity.	K1	CO1
e) State the Set-up Cost.	K1	CO1
<b>2. Multiple Choice Questions.</b>	<b>(5 x 1 = 5)</b>	
a) The variables taken for solution are called ____ 1. Non-basic variables 2. Basic variables 3. Constant 4. Basic solution	K1	CO1
b) ____ is one of the condition for solving assignment problem. 1. Maximization 2. Minimization 3. Optimization 4. None	K1	CO1
c) An item is replaced immediately after its failure ____ 1. Individual replacement 2. Group replacement 3. Probability 4. None of the above	K1	CO1
d) Minimum time taken to complete the project is ____ time. 1. Optimistic 2. Most likely 3. Pessimistic 4. Good	K1	CO1
e) The period of time between two consecutive placement of orders is called ____ 1. Order cycle 2. Lead time 3. Holding cost 4. Production cost	K1	CO1
<b>3. True or False.</b>	<b>(5 x 1 = 5)</b>	
a) The first phase of OR is formulation of the problem.	K2	CO1
b) Transportation problem deals with the transportation of commodity from different sources to different destinations.	K2	CO1
c) Replacement of items which deteriorate and whose maintenance cost decreases with time.	K2	CO1
d) PERT expands Programme Evaluation and Review Technique.	K2	CO1
e) The nature of demand must be known for inventory control.	K2	CO1

<b>4. Match the following.</b>	<b>(5 x 1 = 5)</b>	
a) Linear Programming – 1. No job is allotted to more than one worker	K2	CO1
b) Assignment problem – 2. Critical Path Method	K2	CO1
c) Sequencing problem – 3. Cost associated with carrying the inventory	K2	CO1
d) CPM – 4. Optimal solution	K2	CO1
e) Holding cost – 5. Find the sequence of the jobs	K2	CO1

### SECTION B

Answer any TWO of the following in 100 words						(2 x 10 = 20)																															
5.	Solve graphically  Maximize $Z= 3x_1 + 4x_2$ subject to the constraints  $-3x_1 + 2x_2 \leq 6$  $3x_1 + x_2 \geq 6$  $x_1 + x_2 \leq 8 \qquad x_1, x_2 \geq 0$					K3	CO2																														
6.	Obtain an initial basic feasible solution to the following transportation Problem using Least cost method <table><tr><td></td><td>D</td><td>E</td><td>F</td><td>G</td><td>Available</td></tr><tr><td>A</td><td>1</td><td>2</td><td>3</td><td>4</td><td>6</td></tr><tr><td>B</td><td>4</td><td>3</td><td>2</td><td>0</td><td>8</td></tr><tr><td>C</td><td>0</td><td>2</td><td>2</td><td>1</td><td>10</td></tr><tr><td>Requirements</td><td>4</td><td>6</td><td>8</td><td>6</td><td></td></tr></table>						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		K3	CO2
	D	E	F	G	Available																																
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C	0	2	2	1	10																																
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7.	Find the sequence of jobs that minimizes the total elapsed time to complete the following jobs on two machines. <table><tr><td>Job</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>Machine A</td><td>3</td><td>12</td><td>5</td><td>2</td><td>9</td><td>11</td></tr><tr><td>Machine B</td><td>8</td><td>10</td><td>9</td><td>6</td><td>3</td><td>1</td></tr></table>					Job	1	2	3	4	5	6	Machine A	3	12	5	2	9	11	Machine B	8	10	9	6	3	1	K3	CO2									
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8.	Solve the following assignment problem <table><tr><td></td><td>I</td><td>II</td><td>III</td><td>IV</td></tr><tr><td>A</td><td>10</td><td>5</td><td>13</td><td>15</td></tr><tr><td>B</td><td>3</td><td>9</td><td>18</td><td>3</td></tr><tr><td>C</td><td>10</td><td>7</td><td>3</td><td>2</td></tr><tr><td>D</td><td>5</td><td>11</td><td>9</td><td>7</td></tr></table>						I	II	III	IV	A	10	5	13	15	B	3	9	18	3	C	10	7	3	2	D	5	11	9	7	K3	CO2					
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C	10	7	3	2																																	
D	5	11	9	7																																	

### SECTION C

Answer any TWO of the following in 100 words										(2 x 10 = 20)	
9.	The maintenance cost and the resale price of a truck are given below:									K4	CO3
	Year	1	2	3	4	5	6	7	8		
	Mainte	1000	1300	1700	2200	2900	3800	4800	6000		

- nance cost								
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.

10. 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 sale that may be expected if an optimum assignment is made?

11. A manufacturer has to supply 12000 units of a product per year to his customer. Shortages are not permitted and there is no lead time. The inventory holding cost is Rs. 0.20 per unit per month and the set-up cost per run is Rs.350.

Determine

- The economic lot size
- The period of one run
- The minimum annual inventory cost

12. A small Project consisting of 12 activities have the following information regarding duration of the various activities.

Operati ons	0-1	0-2	0-3	1-4	2-3	2-6	3-4	3-5	4-7	5-6	5-7	6-7
Durati ons	5	8	3	4	0	7	4	6	6	7	2	6

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

## SECTION D

Answer any ONE of the following in 250 words

(1 x 20 = 20)

13. Solve by simplex method

Maximize  $Z = 2x_1 + 2x_2 + 4x_3$  subject to the constraints

$$2x_1 + 3x_2 + x_3 \leq 300$$

$$x_1 + x_2 + 3x_3 \leq 300$$

$$x_1 + 3x_2 + x_3 \leq 240$$

$$x_1, x_2, x_3 \geq 0$$

14. A firm has 3 factories producing certain product and it is to be transported to five distribution centers. The unit transportation costs (in 100's of Rupees) from factories to the distribution centers 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 **optimally** minimize the overall shipping cost. (Using VAM)

K5 CO4

### SECTION E

Answer any ONE of the following in 250 words

(1 x 20 = 20)

15. Determine the sequence which minimizes the total time for processing five jobs on three machines A, B and C. The following table gives the processing times.

Job	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

K6 CO5

16. 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

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- 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.

K6 CO5

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