

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**



**B.C.A. DEGREE EXAMINATION – COMPUTER APPLICATIONS**

**FIRST SEMESTER – NOVEMBER 2019**

**UCS 1301 – OPERATIONS RESEARCH**

Date: 05-11-2019  
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

**PART-A**

**Answer ALL questions**

**10 X 2=20**

1. Define optimum basic feasible solution.
2. Mention the use of slack variables.
3. Define an assignment problem.
4. List out the methods of solving Transportation problem.
5. Define Activity & Node.
6. What is a sequencing problem?
7. What is Holding Cost?
8. What is reordering level?
9. When replacement is made?
10. What is present worth factor?

**PART-B**

**Answer ALL questions**

**5 X 8=40**

11 a) A Company sells two different products A, and B making a profit of Rs40 and Rs30 per unit on them, respectively. They are produced in a common production process and are sold in two different markets. The production process has a total capacity of 30,000 man-hours. It takes three hours to produce a unit of A and one hour to produce a unit of B .The market has been surveyed and company officials feel that the maximum number of units of A that can be sold is 8000 units and that of B is 12000 units. Subject to these limitations product can be sold in any combination. Formulate this problem as an LP model to maximize profit.

(OR)

11 b) Solve the following l.p.p graphically.

$$\text{Max } Z = 10 x_1 + 15x_2$$

$$\text{Subject to } \begin{array}{rcl} 2 x_1 + x_2 & \leq & 26 \\ 2 x_1 + 4x_2 & \leq & 56 \\ - x_1 + x_2 & \leq & 5 \end{array}$$

$$x_1, x_2 \geq 0$$

12 a) Find an initial allocation by Vogel's approximation method for the following transportation problem whose cost matrix availability at each plant and requirements at each warehouse are given as follows

Warehouse Plant	W1	W2	W3	W4	Availability
P1	48	60	56	58	140
P2	45	55	53	60	260
P3	50	65	60	62	360
P4	52	64	55	61	220
Requirements	200	320	250	210	

(OR)

12 b) Five men are available to do five different jobs. From past records, the time (in hours) that each man take to do each job is known and given in the table

		Jobs				
		I	II	III	IV	V
Men	A	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

Find the assignment of men to jobs that will minimize the total time taken.

13 a) A book binder has one printing press, one binding machine and manuscripts of 7 different books .The times required for performing printing and binding operations for different books are shown below

Book	: 1	2	3	4	5	6	7
Printing(hrs)	:20	90	80	20	120	15	65
Binding(hrs)	:25	60	75	30	90	35	50

Decide the optimum sequence of processing of books in order to minimize the total time required to bring out all the books

(OR)

13 b) A project consists of a series of activities called A,B,...I with the following relationship  $W < X, Y$  means X and Y cannot start until W is completed with this notation construct a network diagram having the following constraints  
 $A < D, E$  ;  $B, D < F$  ;  $C < G$  ;  $B < H$  ;  $F, G < I$

14 a) A company uses annually 24,000 units of raw material which costs Rs1.25/unit placing each order cost Rs.22.50 and the carrying cost is 5.4%/year of the average inventory. Find the total cost including the cost of material.

(OR)

14 b) The daily demand for a commodities 100 units Every time an order is places a fixed cost of Rs.100 is incurred. The daily holding cost/unit inventory is Rs.0.02.If the lead-time is 12 days, determine the E.O.Q and reorder point.

15a) Assume that the present value of 1 Re to be spent in a year time is Rs0.9 and the capital cost is Rs.3000 and the maintenance cost are given below when should the machine be replaced?

Year	:1	2	3	4	5	6	7
Maintenance cost:	500	600	800	1000	1300	1600	2000

(OR)

15 b) A fleet owner finds from his past records that the costs per year of running a vehicle whose purchase price is Rs.50,000 are as under:

Year	1	2	3	4	5	6	7
Running cost(Rs)	5000	6000	8000	10000	13000	16000	20000
Resale value(Rs)	40000	30000	20000	15000	10000	7000	5000

Thereafter, running cost increases by Rs.2,000 but resale value remains constant at Rs.2,000. At what age is the replacement due?

### PART C

Answer any TWO

2 X 20=40

16 a) Use simplex method to solve the following l.p.p

$$\begin{aligned} \text{Max } Z &= 3x_1 + 5x_2 + 4x_3 \\ \text{Subject to } & 2x_1 + 3x_2 \leq 8 \\ & 2x_2 + 5x_3 \leq 10 \\ & 3x_1 + 2x_2 + 4x_3 \leq 5 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

b) A dairy firm has three plants located in a state. The daily production at each plant is as follows:

Plant:	1	2	3
Milk supply:	6	1	10

Each day the firm must fulfill the needs of its four distribution centers. Minimum requirements at each center is as follows:

Center:	1	2	3	4
Milk supply:	7	5	3	2

Cost in hundreds of rupees of shipping one million liter from each plant to each distribution center is given in the following table:

Distribution center

	D1	D2	D3	D4
P1	2	3	11	7
P2	1	0	6	1
P3	5	8	15	9

17 a) We have six jobs, each of which must go through machines A, B, C in order ABC

Processing time (hrs) are given in the table

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

Determine the sequence of jobs that will minimize the elapsed time.

b) A project consists of a series of activities called A, B, ..., I with following constraints

A < D; A < E; B < F; C < G; D < H; E, F < I

The project has the following time schedules.

Task	A	B	C	D	E	F	G	H	I
Optimistic time:	5	18	26	16	15	6	7	7	3
Pessimistic time:	10	22	40	20	25	12	12	9	5
Most likely time:	8	20	33	18	20	9	10	8	4

Draw the network diagram of activities and determine the critical path.

18 a) The production department for a company requires 3600 kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs. 36 and the cost carrying inventory is 25% of the investment in the inventories. The price is Rs. 10 per kg. The purchase manager wishes to determine an ordering policy for raw material.

b) A firm is considering replacement of a machine, whose cost price is Rs. 12200 and the scrap value Rs. 200. The running costs are found from experience to be as follows.

Year	1	2	3	4	5	6	7	8
Running cost:	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

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