

(20519)

Roll No.

Total Questions : 13]

[Printed Pages : 7

18019

B.C.A. IVth Semester Examination, May-2019

OPTIMIZATION TECHNIQUES

(BCA-404)

Time : 3 Hrs.]

[M.M. : 75

Note :- Attempt all the Sections as per instructions.

Section-A

(Very Short Answer Type Questions) 3×5=15

Note :- Attempt all the *five* questions. Each question carries 3 marks.

1. Write a linear programming problem in matrix form.
2. Describe classification of inventory models.
3. Describe present value and discount rate.

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Turn Over

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4. Explain sequencing problem.
5. Explain queue length, waiting time and traffic intensity.

Section-B

(Short Answer Type Questions) $7\frac{1}{2} \times 2 = 15$

Note :- Attempt any *two* questions from this section. Each question carries $7\frac{1}{2}$ marks.

6. Solve the following assignment problem :

		Person		
		A	B	C
1		120	100	80
Job	2	70	90	110
	3	110	140	120

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(2)

7. The cost of a machine is Rs. 6,100 and its resale value is only Rs. 100. The maintenance costs are found from experience to be as under :

Year	1	2	3	4	5	6	7	8
Maintenance Cost in Rs.	100	250	400	600	900	1250	1600	2000

When should machine be replaced.

8. We have five jobs each of which must go through two machines A and B in the order AB. Processing times in hours are given below :

Job	1	2	3	4	5
Machine A (A _i)	5	1	9	3	10
Machine B (B _i)	2	6	7	8	4

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(3)

Turn Over

Determine sequence for the five jobs that will minimize the elapsed time T.

Section-C

(Long Answer Type Questions) 3×15=45

Note :- Attempt any *three* questions out of the following *five* questions. Each question carries 15 marks.

9. Solve the following LPP.

$$\text{max. } Z = 2x_1 + 4x_2$$

$$\text{s.t. } 2x_1 + 3x_2 \leq 48$$

$$x_1 + 3x_2 \leq 42$$

$$x_1 + x_2 \leq 21$$

$$x_1, x_2 \geq 0$$

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(4)

10. Solve the following transportation problem :

		To				Supply
		1	2	3	4	
From	1	3	6	8	5	20
	2	6	1	2	5	28
	3	7	8	3	9	17
Demand		15	19	13	18	

11. Let the value of money be assumed to be 10% per year and suppose that machine A is replaced after every 3 years whereas machine B is replaced after every six years. The yearly costs of the machines are given as under :

Year	1	2	3	4	5	6
Machine A	1000	200	400	1000	200	400
Machine B	1700	100	200	300	400	500

Determine which machine should be purchased.

NA-572

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Turn Over

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12. We have five jobs each of which must go through the machines A, B and C in order ABC. Processing times are :

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

Determine a sequence for the five jobs that will minimize the elapsed time.

13. ATV repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which

they came in and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hour day. What is repairman's expected idle time each day ? How many jobs are ahead of the average set just brought ?

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Roll No.....

BCA-IV Sem.

18019

B.C.A. Examination, May 2017

Optimization Techniques

(BCA-404)

(New)

Time : Three Hours]

Maximum Marks : 75

Note : Attempt **all** the sections as per instructions.

Section-A

Note : Attempt **all five** questions. Each question carries 3 marks.

1. What is the condition in algorithm that an L.P.P. has unbounded solution?
2. Define inventory problem. List the various

P.T.O.

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- costs associated with an inventory problem.
- Define money value, present value and discount rate.
 - Define queue length, waiting time and busy period.
 - Explain sequencing problem.

Section-B

Note : Attempt any two questions from this section. Each question carries 7.5 marks.

$$7\frac{1}{2} \times 2 = 15$$

- Solve the following assignment.

Problem :

Man →	1	2	3	4
Job ↓				
I	12	30	21	15
II	18	33	9	31
III	44	25	24	21
IV	23	30	28	14

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- Solve by graphical method the linear programming problem .

$$\min z = 20x_1 + 10x_2$$

$$\text{such that } x_1 + 2x_2 \leq 40$$

$$3x_1 + x_2 \geq 30$$

$$4x_1 + 3x_2 \geq 60$$

$$\text{and } x_1, x_2 \geq 0$$

- We have five jobs, each of which have to go through the machines A, B and C in the order ABC.

	Processing time in hours				
Jobs	1	2	3	4	5
Machine A (A_i)	5	7	6	9	5
Machine B (B_i)	2	1	4	5	3
Machine C (C_i)	3	7	5	6	7

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P.T.O.

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Determine a sequence for the jobs that will minimize the total elapsed time.

Section-C

Note : Attempt any **three** questions out of the following **five** questions. Each question carries 15 marks.

9. Solve the following LPP

$$\text{Max } z = 40x_1 + 35x_2$$

subject to

$$2x_1 + 3x_2 \leq 60$$

$$4x_1 + 3x_2 \leq 96$$

$$x_1, x_2 \geq 0$$

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10. Solve the following transportation problem

	D ₁	D ₂	D ₃	Available
O ₁	2	7	4	5
O ₂	3	3	1	8
O ₃	5	4	7	7
O ₄	1	6	2	14
Required	7	9	18	

11. On average 96 patients per 24 hour day require the service of an emergency clinic. Also on average a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs. 100 per patient treated to obtain an average serving time of 10 patients and that each minute of decrease in the average time would cost by Rs. 10 per patient treated. How much

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P.T.O

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would to be budgeted by the clinic to decrease the average size of the queue from one and one third patients to half a patient?

12. The cost of new machine is Rs. 5000. The maintenance cost of n^{th} year is given by $C_n = 500(n-1)$, $n=1, 2, \dots$. Suppose that the discount rate per year is 0.5. After how many years it will be economical to replace the machine by new one?
13. Use graphical method to minimize the time needed to process the following jobs on machines shown below i.e. for each machine find the job which should be done first. Also calculate the total time needed to complete both jobs.

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Job1		Job2	
Sequence of Machines	Time	Sequence of Machines	Time
A	2	C	4
B	3	A	5
C	4	D	3
D	6	E	2
E	2	B	6

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11. The cost pattern for two machines A and B when money value is not considered is given as follows :

Year	Cost at the beginning of year in Rs.	
	Machine A	Machine B
1	900	1400
2	600	100
3	700	700
Total	2200	2200

Find the cost pattern for each machine when money worth is 10% per year and hence find which machine is less costly.

12. We have five jobs, each of which must go through the machine A, B and C in the order ABC :

Processing Times in hours

Job No. i	1	2	3	4	5
Machine A (A_i)	5	7	6	9	5
Machine B (B_i)	2	1	4	5	3
Machine C (C_i)	3	7	5	6	7

Determine a sequence for the jobs that will minimize the total elapsed time.

13. Customers arrive at a sales counter manned by a single person according to a Poisson process with a mean rate at 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of a customer and queue length.

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Roll No.

BCA- IV Sem.

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B. C. A. Examination, May 2018

Optimization Techniques

(BCA-404)

(New)

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt questions from all Sections as per instructions.

Section-A

(Very Short Answer Questions)

Attempt all the five questions. Each question carries 3 marks. Very short answer is required. $3 \times 5 = 15$

1. Define a linear programming problem.
2. Define money value and present value.
3. Define busy period, idle period and mean arrival rate.
4. Explain travelling salesman problem.
5. Describe holding cost, shortage cost and ordering cost.

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Section-B

(Short Answer Questions)

Attempt any *two* questions out of the following three questions. Each question carries $7\frac{1}{2}$ marks. Short answer is required. $7\frac{1}{2} \times 2 = 15$

6. Solve the following assignment problem :

		Subordinates			
		I	II	III	IV
Tasks	A	8	26	17	11
	B	13	28	4	26
	C	38	19	18	15
	D	19	26	24	10

7. The cost of an item is 3,000. The salvage value and running cost are given below. Find the most economical replacement age of the item :

Year	Running cost	Salvage cost
1	600	2000
2	700	1333
3	800	1000
4	900	750
5	1000	500
6	1200	300
7	1500	300

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8. Find the sequence that minimizes the total elapsed time required to complete the following tasks on two machine :

	A	B	C	D	E	F	G	H	I
Machine-I	2	5	4	9	6	8	7	5	4
Machine-II	6	8	7	4	3	9	3	8	11

Section-C

(Detailed Answer Questions)

Attempt any *three* questions out of the following five questions. Each question carries 15 marks. Answer is required in detail. $15 \times 3 = 45$

9. Solve the following L. P. P. :

Maximize $z = 5x_1 + 3x_2$

s. t. $3x_1 + 5x_2 \leq 15$

$5x_1 + 2x_2 \leq 10$

$x_1, x_2 \geq 0$

10. Solve the following transportation problem :

		To			Supply
		1	2	3	
From	1	2	7	4	5
	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
Demand		7	9	18	34

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10. Use simplex method to solve the following LPP :

$$\text{Maximize : } Z = 4x_1 + 10x_2$$

$$\text{Subject to : } 2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$x_1, x_2 \geq 0$$

11. Obtain the dual problem of the following LPP :

$$\text{Maximize : } f(x) = 2x_1 + 5x_2 + 6x_3$$

$$\text{Subject to : } 5x_1 + 6x_2 - x_3 \leq 6$$

$$-2x_1 + x_2 + 4x_3 \leq 4$$

$$x_1 - 5x_2 + 3x_3 \leq 1$$

$$-3x_1 - 3x_2 + 7x_3 \leq 6$$

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

Also verify that the dual of the dual problem is the primal problem.

12. Derive the Wilson EOQ formula. What are the practical limitations of EOQ formula? Also discuss the costs involved in an inventory problem.
13. Explain the following :
- Present worth factor (pwf)
 - Discount rate
 - Dual simplex method
 - Group replacement and individual replacement policy
 - Tic-tac problem.

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V

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Roll No.

BCA-IV Sem.

18019

B. C. A. Examination, May 2016

OPTIMIZATION TECHNIQUES

(BCA-404)

(New)

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt questions from all Sections as per instructions.

Section-A

(Very Short Answer Questions)

Attempt all the five questions of this Section.

Each question carries 3 marks. Very short answer is required not exceeding 75 words. $3 \times 5 = 15$

- Define a general and standard linear programming problem.
- Solve the following LPP by graphical method :
Maximize : $z = 2x_1 + x_2$
Subject to : $3x_1 + 4x_2 \leq 6$
 $6x_1 + x_2 \leq 3$
 $x_1, x_2 \geq 0$.

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- Customers arrive at a booking office window, being manned by a single individual at a rate of 25 per hour. Time required to serve a customer has exponential distribution with a mean of 120 seconds. Find the mean waiting time of a customer in the queue.
- Draw economic order quantity graph showing the relationship of inventory costs with order quantity and inventory level overtime.
- Explain briefly replacement policies for items whose efficiency deteriorates with time.

Section-B

(Short Answer Questions)

Attempt any *two* questions from this Section. Each question carries $7\frac{1}{2}$ marks. $7\frac{1}{2} \times 2 = 15$

- Find the sequence that minimizes total elapsed time to complete the following six jobs and also find the minimum time :

Jobs :	1	2	3	4	5	6
Machine I :	3	12	15	6	10	9
Machine II :	8	10	10	6	12	3

- Solve the following assignment problem represented by the matrix :

(3).

	I	II	III	IV	V
A	6	5	8	11	16
B	1	13	16	1	10
C	16	11	8	8	8
D	9	14	12	10	16
E	10	13	11	8	16

- Obtain the steady state equations for the model $\{(M/M/1):(\infty/FCFS)\}$ and also find the formula for mean and the variance of the queue length.

Section-C

(Detailed Answer Questions)

Attempt any *three* questions from this Section. Each question carries 15 marks. $15 \times 3 = 45$

- Determine an optimum basic feasible solution to the transportation problem given below :

	D ₁	D ₂	D ₃	D ₄	
O ₁	1	2	3	4	6
O ₂	4	3	2	0	8 Capacity
O ₃	0	2	2	1	10
	4	6	8	6	24 Demand

where O_i and D_j denote i th origin and j th destination respectively.

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