BC - 2879

B.C.A. (Semester-IV) Exam.-2015

Optimization Technique

Time : Three Hours
Maximum Marks : **75**

Note :- Attempt questions from all the sections.

SECTION - A

(Short Answer Type Questions)

Note : Attempt **any ten** questions. Each question carries 3 marks. 10×3=30

1. Solve the following L.P.P. by graphical method

Maximize, $z = 6x_1 + 11x_2$

Subject to the constraints

$2x_1 + x_2 \leq 104$

$x_1 + 2x_2 \leq 76$ and $x_1, x_2 \geq 0$

2. A dietician decides a certain minimum intake of vitamins A, B, C for a family. The minimum

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daily needs of vitamins A,B,C are 30,20,16 units respectively. For the supply of these, the dietician depends on two types of food X and Y. The first one give 7, 5, 2 units per gram of vitamins A, B, C respectively. The second one gives 2, 4, 8 units per gram of these vitamins respectively. The first food cost Rs. 2 per gram and the second Re. 1 per gram.

3. What is the difference between transportation problem and assignment problem.

4. Define term :

   (i) Mean service rate

   (ii) Steady state

5. Determine the initial basic feasible solution to the following trasportation problem using lowest cost entry method :

		Destinations				
		A	B	C	D	Supply
Origin	1	1	5	3	3	34
	2	3	3	1	2	15
	3	0	2	2	3	12
	4	2	7	2	4	19
Demand		21	25	17	17	

6. What do you understand by a queue? Give some important application of queueing theory.

7. What is replacement problem? Describe some important replacement situations.

8. Customers arrive at a sales counter managed by a single person according to a poisson process with a mean rate of 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.

9. A firm is considering replacement of a machine whose cost price is Rs. 12,200; and the scrap value is Rs. 200. The maintenance costs are found from experience to be as follows :

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced.

10. We have five jobs, each of which must go through two machines on order AB, processing times are given in the following table :

Job No.	1	2	3	4	5
Machine A	10	2	18	6	20
Machine B	4	12	14	16	8

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

11. What are different inventory costs associated with inventory control?

12. An aircraft company uses revels at an approximate customer rate of 2,500 kg/year.

Each unit cost Rs. 30/Kg and the company. Personal estimate that it costs Rs. 130 to place an order and that the carrying cost of inventory is 10% per year. How frequently should order for revels be placed? Also determine the optimum size of each order.

13. Give the dual of the linear programming problem :

Min $z = 2x_1 + 3x_2 + 4x_3$

Subject to the constraints $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 = 3$

$x_1 + 4x_2 + 6x_3 \leq 5$, $x_1, x_2 \geq 0$

x_3 is unrestricted

14. What is unbalanced assignment problem and unbalanced transportation problem?

15. State when model α - model is called pure birth process in queueing theory.

SECTION - B

(Long Answer Type Questions)

Note : Attempt **any three** questions. Each question carries 15 marks. 15×3=45

1. Explain (M/M/1) : (∞/FCFS) queueing model. Derive and solve the difference equations in steady state of the model.

2. Solve the following L.P.P. by Big M-method

   Maximize $Z = x_1 + x_2 + 3x_3$

   S.T. $3x_1 + 2x_2 + x_3 \leq 3$

   $2x_1 + x_2 + 2x_3 \geq 3$ and $x_1, x_2, x_3 \geq 0$

3. Describe the problem of replacement of items whose maintenance costs increase with time. You may assume that the value of money remains constant. Hence establish the following rule for replacement. Do not replace if the next period cost is less than the weighted average of previous costs.

4. Find the optimum solution to the following transportation problem by using VAM method

for which the cost, origin, availabilities and destination requirements are given

		7θ			
		1	2	3	
From	I	2	7	4	5
	II	3	3	7	8
	III	5	4	1	7
	IV	1	6	2	14
		7	9	18	

5. Solve the following assignment problem :

	Route			
Company	A	B	C	D
1	4000	5000	-	-
2	-	4000	-	4000
3	3000	-	2000	-
4	-	-	4000	5000

6. Use dual simplex method to solve the following linear programming problem :

$$\text{Min } Z = x_1 + x_2$$

Subject to $2x_1 + x_2 \geq 2$

$-x_1 - x_2 \geq 1$

$x_1, x_2 \geq 0$

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B.C.A.(Semester-IV) EXAM.-2016

Optimization Technique

Time : Three Hours
Maximum Marks : **75**

Note : Attempt questions from all sections.

SECTION - A

(Short-answer Type Questions)

Note : Attempt **any 10** questions. Each question carries 3 marks. 10×3=30

1. Define Basic feasible solution and slack variable.

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2. Solve the following IPP using the simplex method.

$$Max\ z = -x_1 + 4x_2$$
$$Subject\ to\ x_1 - x_2 \leq 1$$
$$-2x_1 + x_2 \leq 2$$
$$and\ x_1, x_2 \geq 0$$

3. What is replacement problem? Describe some important replacement situations.

4. Balance the following transportation problem:

	D_1	D_2	D_3	D_4	$q_1\downarrow$
S_1	10	0	20	11	10
S_2	12	7	94	20	8
S_3	0	14	15	18	7
$b_1\rightarrow$	5	15	10	15	

5. Solve the following assignment problem :

		Job		
		J_1	J_2	J_3
Person	P	20	15	18
	Q	25	15	12
	R	30	20	20

6. Find the economic lot size, the associated total cost, and the duration between two orders. It is given that the set-up cost is 100 Rs, the daily holding cost per unit of inventory is 5 paise, and daily demand is approximately 30 units.

7. Define the inventory costs.

8. Write Johnson's algorithm for processing n jobs two machines

9. We have five jods, each of which must go through two machines on arder AB, processing

times are given in the following table.

Job No.	1	2	3	4	5
Machine A	10	2	18	6	20
Machine B	4	12	14	16	8

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

10. (i) Solve the following LPP using the graphical method

$$Max\ z = -x_1 + 2x_2$$
$$Subject\ to = -x_1 + x_2 \leq 1$$
$$x_1 + x_2 \leq 2$$
$$and\ x_1, x_2 \geq 0$$

11. State where model $\propto -$ model is called pure birth process in queueing theory

12. Define Queue and Service Mechanism.

13. Write the algorithm of simplex method.

14. Solve the following LPP using the graphical method:

$$MinZ = -5x_1 + 10x_2$$
$$Subject\ to = -x_1 + x_2 \leq 1$$
$$x_1 + x_2 \leq 2$$
$$and\ x_1, x_2 \leq 0$$

15. What is the difference between transportation problem and assignment problem.

SECTION - B

(Long Answer type questions)

Note : Attempt **any 3** questions. Each question carries 15 marks. 15x3=45

1. Solve the following LPP using the Big-M-method

$$Max\ Z = -x_1 + x_2$$
$$Subject\ to\ x_1 + x_2 \leq 1$$
$$2x_1 + 3x_2 \geq 6$$
$$and\ x_1 + x_2 \geq 0$$

2. Find the initial BFS of the following transportation problem suing VAM:

	D_1	D_2	D_3	Available
S_1	2	7	4	5
S_2	3	3	1	8
S_3	5	4	7	7
S_4	1	6	2	14
Req.	7	9	18	34

3. Solve the following assignment problem

		Job			
		J_1	J_2	J_3	J_4
Person	A	10	14	22	12
	B	16	10	18	12
	C	8	14	8	14
	D	20	8	16	6

4. Use dual simplex method to the following LPP

$Min\ Z = x_1 + x_2$

$Subject\ to = 2x_1 + x_2 \geq 2$

$-x_1 - x_2 \geq 1$

$x_1, x_2 \geq 0$

5. Explain (M/M/1) : $(\infty / FCFS)$ queueing model. Derive and solve the difference equations in steady state of the model.

6. Solve the following sequencing problem to minimize the total elapsed time

Job No.→	J1	J2	J3	J4	J5	J6
Machine M_1	3	12	18	9	15	6
Machine M_2	9	18	24	24	3	15

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B.C.A. (Semester-IV) Examination–2017

Optimization Technique

Time : Three Hours

Maximum Marks : **75**

Note : Attempt questions from all sections.

SECTION - A

(Short-answer Type Questions)

Note : Attempt **any ten** questions. Each question carries 3 marks. 10x3=30

1. Define individual and group replacement with suitable examples.

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2. Solve the following LPP graphically

$$Max\ z = 6x_1 + 9x_2$$
$$Subject\ to\ constraints$$
$$2x_1 + 4x_2 \leq 3{,}000$$
$$3x_1 + x_2 \leq 3{,}000$$
$$2x_1 + 1.6x_2 \leq 3,000 \ \&\ x_1, x_2 \geq 0$$

3. Define the characteristics of queing system.

4. Discuss different types of costs involved in inventory.

5. Find the economic lot size, the associated total cost, and the duration between two orders. It is given that the setup cost is 100 Rs. The daily holding cost per unit of inventory is 5 paise and daily demand is approximately 30 units.

6. Define Johnson's algorithm for processing n jobs on two machines.

7. Define queue and service mechanism.

8. Define transportation problem with suitable example.

9. Define assignment problem with suitable example.

10. Determine the sequence for the five jobs that will minimize the elapsed time T, each job must go through 2 machines A and B. In order AB, processing time in hrs. are as follows :

Jobs	1	2	3	4	5
Time on Macine A (Ai)	5	1	9	3	10
Time on Macine B (Bi)	2	6	7	8	4

11. Define simplex method with suitable example.

12. Solve LPP by graphical method

$$\max \quad z = -x_1 + 2x_2$$
$$subject\ to = -x_1 + x_2 \leq 1$$
$$x_1 + x_2 \leq 2 \ and \ x_1, x_2 \geq 0$$

13. State where model ∞ - model is called pure birth process in queuing theory.

14. Discuss about best replacement age of machine.

15. Define Basic feasible solution with suitable example.

SECTION - B

(Long Answer type questions)

Note : Attempt **any three** questions. Each question carries 15 marks. 15x3=45

1. Describe Big - M method and solve the following LPP

$$\text{Minimize } z = 5x_1 + 3x_2$$
$$\text{Subject to}$$
$$2x_1 + 4x_2 \leq 12$$
$$2x_1 + 2x_2 = 10$$
$$5x_1 + 2x_2 \geq 10$$
$$\text{and } x_1, x_2 \geq 0$$

2. Solve the following transportation problem for its optimum solution also initial solution with NCOCR method.

	D_1	D_2	D_3	Supply
A	11	9	6	35
B	12	14	11	45
C	10	8	10	30
Supply	40	50	40	

3. Use dual simplex method to the following LPP

$$\min\ z = x_1 + x_2$$
$$subject\ to\ 2x_1 + x_2 \geq 2$$
$$-x_1 - x_2 \geq 1$$
$$and\ x_1, x_2 \geq 0$$

4. Solve the initial BFS of the following transportation problem using VAM

	D_1	D_2	D_3	Available
S_1	2	7	4	5
S_2	3	3	1	6
S_3	5	4	7	7
S_4	1	6	2	14
Req.	7	9	18	34

5. Describe two phase method of LPP with all steps and suitable example.

Describe Model I of queuing model i.e.

$\{(M/M/U:(\infty/FCFS)\}$

with all steps

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B. C. A. (Fourth Semester)

EXAMINATION, 2019

OPTIMIZATION TECHNIQUE

Time : Three Hours

Maximum Marks : 75

Note : Attempt questions from both Sections as directed.

Section—A

(Short Answer Type Questions)

Note : Attempt any *ten* questions. Each question carries 3 marks. 10×3=30

1. Write the different techniques which we use in Operation Research.
2. State the management application of Operation Research.

3. Express the following LPP in standard form :

Minimum :

$$Z = 3x_1 + 4x_2 + 7x_3$$

Subject to :

$$2x_1 + 3x_2 - 2x_3 \leq 30$$
$$4x_1 - 2x_2 + x_3 \leq 22$$
$$x_1 - 5x_2 - 6x_3 \geq 4$$

$x_1 \geq 0$, x_2, x_3 are unrestricted.

4. Write algorithm of dual simplex method.
5. How do you categorise the queuing models in queuing theory ?
6. Solve the following LPP graphically :

Minimum :

$$Z = 5x + 7y$$

Subject to constraints :

$$x + 3y \geq 6$$
$$5x + 2y \geq 10$$
$$y \leq 4$$
$$x, y \geq 0$$

7. Explain the method of solving tic-tac problem.

8. Use simplex method to solve the following LPP :

Maximize :

$$Z = 20x_1 + 30x_2$$

Subject to :

$$3x_1 + 3x_2 \leq 36$$

$$5x_1 + 2x_2 \leq 50$$

$$2x_1 + 6x_2 \leq 60$$

and $x_1, x_2 \geq 0$.

9. Write formulae for the following statements :

(a) Probability of no. of customers in the system,

(b) Average (expected) queue length

(c) Probability [Queue size $\geq$ N]

10. Find the sequence that minimizes the total elapsed time required to complete the following jobs :

Job No.	Processing Time	
	A_i	B_i
1	2	6
2	5	8
3	4	1
4	3	2
5	2	3
6	1	5

11. Write algorithm for processing of n jobs through 2 machines.

12. The number of man-hours needed to complete a job for each job-man combination are given below :

		Jobs			
		A	B	C	D
Men	1	5	3	1	8
	2	7	9	2	6
	3	6	4	5	7
	4	5	7	7	6

Find the optimal assignment that will result in minimum man-hours needed.

13. Explain primal and dual form of linear programming problem.

14. Write the characteristics of queuing system.

15. Assuming that present value of one rupee to be spent in a year's time is ₹ 0.9 (v = 0.9) and A = ₹ 3,000 capital cost of equipment and the running cost are given in the table below. When should the machine be replaced ?

Year (n)	Running cost (₹)
1	500
2	600
3	800
4	1000
5	1300
6	1600
7	2000

Section—B

(Long Answer Type Questions)

Note : Attempt any *three* questions. Each question carries 15 marks. 3×15=45

1. Derive (M/M/1) : (∞/FCFS) queuing model upto the equation $P_n = \rho^n (1 - \rho)$ i.e. probability of *n*-customers in the system.

2. (a) What do you understand by Inventory Theory ? 5

(b) A departmental store has a single cashier. During the rush hours, customers arrive at a rate of λ 20 customers per hour. The average number of customers that can be processed by the cashier is μ 24 hour. Assume that the conditions for use of the single channel queuing model apply : 10

(i) What is probability that the cashier is idle ?

(ii) What is the average number of customers in the queuing system ?

(iii) What is the average time a customer spends in the system ?

(iv) What is the average number of customers in the queue ?

(v) What is the average time a customer spends in the queue waiting for service ?

3. (a) Derive economic lot size model with different rates of demand in different cycles.

(b) A stockist has to supply 400 units of a product every Monday to his customers. He gets the produce at ₹ 50 per unit from the manufacture. The cost of ordering and transportation from the manufacturer is ₹ 75 per order. The cost of carrying

inventory is 7.5% per year of the cost of product. Find :

(i) The economic lot size

(ii) The total optimal cost (including capital cost)

4. Obtain an initial basic solution to the following transportation problem. Is this solution an optimal solution ? If not, obtain the optimal solution :

	W_1	W_2	W_3	W_4	a_i (Supply)
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement b_j	5	8	7	14	

5. Use two phase method to solve the following LPP :

Maximize :

$$Z = 5x_1 + 3x_2$$

Subject to :

$$2x_1 + x_2 \leq 1$$

$$x_1 + 4x_2 \geq 6$$

and $x_1, x_2 \geq 0$.

6. The following mortality rates have been observed for a certain type of light bulbs :

Week	Percent failing by end of week
1	10
2	25
3	50
4	80
5	100

There are 1000 bulbs in use and it costs ₹ 1.00 to replace an individual bulb which has burnt out. If all bulbs were replaced simultaneously it would cost 25 paise per bulb. It is proposed to replace all bulbs at fixed intervals, whether or not they have burnt out and to continue replacing burnt out 6 bulbs as they fail. What intervals should all the bulbs be replaced ?