Roll No. .....

BCA–404(N)

B. C. A. (Fourth Semester) EXAMINATION, May, 2019

(New Course)

Paper Fourth

OPTIMIZATION TECHNIQUES

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

Note : Attempt questions from all Sections as directed.

Inst. : The candidates are required to answer only in serial order. If there are many parts of a question, answer them in continuation.

Section—A

(Short Answer Type Questions)

Note : All questions are compulsory. Each question carries 3 marks.

1. (A) Explain in brief the necessity of Operations Research in industry.

   (B) Write at least *five* application areas of linear programming.

   (C) Convert the following LPP into standard form :

   Minimize :

$$12x_1 + 5x_2$$

3. Determine the optimal sequencing to complete the following task on two machines and also find idle time of machines A and B :

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

4. Solve the following LPP by Simplex method :

   Minimize :

$$z = x_1 - 3x_2 + 2x_3$$

   Subject to :

$$3x_1 - x_2 + 2x_3 \leq 7$$

$$-2x_1 + 4x_2 \leq 12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

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

5. A machine costs ₹ 12,200. The scrap value is ₹ 200. The maintenance costs of the machines are given below :

Year	Maintenance Cost
1	200
2	500
3	800
4	1,200
5	1,800
6	2,500
7	3,200
8	4,000

When should the machine be replaced ?

Section—C

(Long Answer Type Questions)

Note : Attempt any *two* questions. Each question carries 12 marks.

6. A person wants to decide the constituents of a diet which will fulfill his daily requirements of proteins,

fats and carbohydrates at minimum cost. The Choice is to be made from four different types of foods. The yield per unit of these foods are given in table :

Food type	Yield for Unit			Cost per Unit (₹)
	Proteins	Fats	Carbohydrates	
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum requirement	800	200	700	

Formulate the problem as an LPP.

7. A self-service store employs one cashier at its counter. An average of nine customers arrive every 5 minutes while cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate, find :

   (a) Average number of customer in the system.

   (b) Average number of customer in the queue or average queue length.

   (c) Average time a customer spends in the system.

8. Solve the following transportation problem by using VAM method :

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	4	2	3	2	6	8
S_2	5	4	5	2	1	12
S_3	6	5	4	7	3	14
Demand	4	4	6	8	8	

9. Write short notes on the following :
   (a) Setup cost
   (b) Carrying cost
   (c) Shortage cost
   (d) Lead time