

Roll No. _____

22/5067**B.C.A. (Fourth Semester)****Examination, 2022****Fourth Paper****(Optimization Techniques)***Time : Three Hours]**[Maximum Marks : 75*

Note : Attempt any **five** questions. **All** questions carry equal marks.

Note : The answers to short answer type questions should not exceed **200** words and the answers to long answer type questions should not exceed **500** words.

1. (a) Define linear programming problem and discuss statements and properties of basic theorem. 8
- (b) Solve by graphical method, the linear programming problem : 7
 Minimize $z = 20x_1 + 10x_2$
 subject to the constraints,

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$$x_1 + 2x_2 \leq 40$$

$$3x_1 + x_2 \geq 30$$

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

and non-negative restrictions $x_1, x_2 \geq 0$

2. Describe the advantages of simplex method over graphical method to solve a LPP.

Consider the set of equations : $3 + 12 = 15$

$$5x_1 - 4x_2 + 3x_3 + x_4 = 3$$

$$2x_1 + x_2 - 5x_3 - 3x_4 = 0$$

$$x_1 + 6x_2 - 4x_3 + 2x_4 = 15$$

$$x_1, x_2, x_3, x_4 \geq 0$$

If $x_1 = 1, x_2 = 2, x_3 = 1, x_4 = 3$, is a feasible solution, then find a basic feasible solution.

3. Find out the system of steady state equations for the model II in Queueing Theory, and derive the formula for : $5 + 5 + 5 = 15$
 - (a) average number of customers in the system.
 - (b) average length of waiting time.
 - (c) expected waiting time in the queue (excluded service time) i.e. average waiting time if an arrival in the queue.
4. Discuss the classification of queueing models. Arrivals at a telephone booth are considered to be Poisson, with an average time of 10

minutes between one arrival and the next. The length of a phone call assumed to be distributed exponentially with mean 3 minutes. Find the following: $3+4+4+4=15$

- (a) Find the average number of units in the system.
- (b) Find the probability that it will take, an arrival, more than 10 minutes altogether to wait for the phone and complete his call?
- (c) Find the probability that an arrival will have to wait more than 10 minutes before the phone is free.
5. Find the best replacement time of a machine, taking time as discrete and continuous. 15
6. Given demand $D=450$ items per year, ordering cost $s=Rs\ 45$ and carrying cost $c=Rs\ 15$ per unit. Find EOQ and F. 15
7. (a) Define inventory problem and categorize its variables. 3
- (b) Discuss advantages and disadvantages of inventory. 2
- (c) Derive an economic lot size formula and minimum average costs under the following assumptions : 10

- (i) demand is uniform at a rate of r units per unit time
- (ii) production is instantaneous (ie production rate is infinite.)
- (iii) lead time is zero
- (iv) C_1 =holding cost per unit per unit time
- (v) C_3 =set up cost per production run, and
- (vi) shortages are not allowed
8. What is sequencing problem? Discuss its applications at least in two areas. The costs of 5 different jobs to two machines are given as follows : 15

		Jobs				
		1	2	3	4	5
Machines	1	4	7	3	9	6
	2	6	9	5	10	6

Solve the problem assuming that the objective is to minimize the total cost.