

Paper Code : U359-145 (T1) DT U359-125 (T1) meek  
U359-135 (T1) E892  
Total No. of Questions - [4] Total No. of Printed Pages 3  
U359-115 (T1) Civil U359-125 (T1) Comp.  
G.R. No.

**OCTOBER 2019/ INSEM (T1)**  
**T. Y. B. TECH. (CIVIL ENGINEERING) (SEMESTER - I)**  
**COURSE NAME: OPTIMIZATION TECHNIQUES**  
**COURSE CODE: IEU31175CV**  
**(PATTERN 2017)**

Time: [1 Hour]

[Max. Marks: 30]

**(\*) Instructions to candidates:**

- 1) Answer Q.1 OR Q.2 and Q.3 OR Q.4.
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed
- 4) Use suitable data where ever required
- 5) Use Graph Paper

Q.1) a) Describe Linear Programming? Discuss the applications of linear programming to managerial decision making. [6 marks]

b) A firm uses lathes, milling machines and grinding machines to produce two machine parts. Table below represents the machining times required for each part, the machining times available on different machines and the profit on each machine part.

	Machining time required for machine part(minutes)		Maximum time available week(minutes)
	I	II	
Lathes	12	6	3000
Milling Machines	4	10	2000
Grinding machines	2	3	900
Profit per unit	Rs.40	Rs. 100	

Find the number of parts I and II to be manufactured per week to maximize the profit. Use graphical method for the same. [6 marks]

c) For each of the following function determine whether it is convex, concave or neither.

1.  $f(x) = x_1x_2 - x_1^2 - x_2^2$

2.  $f(x) = 20x_1 + 10x_2$

[4 marks]

**OR**

Q.2)a) Explain global and local optima, Concave and Convex functions with examples. [6 marks]

b) A company produces two types of hats. Every hat A requires twice as much labour time as the second hat B. If the company produces only hat B then it can

produce the total of 500 hats a day. The market limits daily sales of hat A and B to 150 and 250 respectively. The profits on Hat A and B are Rs. 8 and Rs. 5 respectively. Solve graphically to get the optimal solution. [6 Marks]

c) Give any two applications of Systems approach in Civil Engineering [4 marks]

Q.3) a) Frontier Bakery keeps stock of a popular brand of cake. Daily demand based on past experience is as given below:-

Daily Demand	0	15	25	35	45	50
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Consider the following sequence of random numbers:-

48,78,09,51,56,77,15,14,68,09

Using the sequence, simulate the demand for the next 10 days. Find out stock situation if the owner of the bakery decides to make 35 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data.

[6 marks]

b) Discuss the characteristics of Queuing model and elaborate on Kendalls notation [4 marks]

c) There are seven jobs, each of which has to go through the machines A and B in the order AB. Processing times in hours are as given: [4 marks]

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time T. Also find T and idle time for machines A and B.

OR

Q.4) a) There are five jobs, each of which is to be processed through three machines A, B and C in the order ABC. Processing times in hours are:

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

Determine the optimum sequence for the five jobs and the minimum elapsed time. Also find the idle time for the three machines and waiting time for the jobs.

[6 marks]

b) A branch of Punjab National Bank has only one typist. Since the typing work varies in length (number of pages to be typed), the typing rate is randomly

distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8 hour work day. If the typewriter is valued at Rs. 1.50 per hour, determine.

1. Equipment utilization
2. The percentage time that an arriving letter has to wait
3. Average system time
4. Average cost due to waiting on the part of typewriter i.e remaining idle.

[4 marks]

c) What is simulation? Which are the steps involved in carrying out Monte Carlo simulation?

[4 marks]