Printed Pages:-04

Subject Code:- ACSBS0401

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2023- 2024)

Subject: Operations Research

Time: 2 Hours **Max. Marks: 50**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* **three Sections -A, B, & C.** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION A **15**

1. Attempt all parts:-

1-a. A solution can be extracted from a model either by (CO1) 1

(a) Conducting experiments on it

(b) Mathematical analysis

(c) Both conducting experiments on it and mathematical analysis

(d) Diversified Techniques

1-b. A set of values of decision variables which satisfies the linear constraints and non-negativity conditions of a L.P.P. is called its (CO2) 1

(a) Unbounded solution

(b) Optimum solution

(c) Feasible solution

(d) None of these

1-c. If there were n workers & n jobs there would be (CO3) 1

(a) n! solutions

(b) (n-1)! solutions

(c) (n!)n solutions

(d) n solutions

1-d. Floats for critical activities will be always _____. (CO4) 1

(a) One

(b) Zero

(c) Highest

(d) Same as duration of activities

1-e. When the operating characteristics of the queue system dependent on time, then it is said to be (CO5) 1

(a) Steady state

(b) Explosive state

(c) Transient state

(d) Any one of the above

2. Attempt all parts:-

2.a. Define a model? (CO1) 2

2.b. Write the primal problem in dual form (CO2) 2

Maximize $Z = 6x_1 + 4x_2$

Subject to constraints,

$2x_1+3x_2 \leq 20$

$2x_1+ x_2 \leq 16$

where $x_1 \geq 0$ & x_2 is unrestricted.

2.c. Discuss the method to convert a maximization transportation problem into a minimization problem. (CO3) 2

2.d. Distinguish between float and slack. (CO4) 2

2.e. What are Pseudo-random numbers? (CO5) 2

SECTION B **15**

3. Answer any <u>three</u> of the following:-

3-a. Discuss the significance and scope of OR in modern management. (CO1) 5

3-b. Solve the following LPP by using Big M method: 5

Maximize $z = 3x_1 - x_2$

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

$x_1 + 3x_2 \leq 3$

$x_1, x_2 \geq 0$

(CO2)

3.c. Solve the following transportation problem by using VAM: (CO3) 5

	A	B	C	D	E	F	Supply
I	9	12	9	6	9	10	5
II	7	3	7	7	5	5	6
III	6	5	9	12	3	11	2
IV	6	8	11	2	2	10	9
Demand	4	4	6	2	4	2	

3.d. A small maintenance project consists of the following jobs, whose precedence relationships are given below. (CO4) 5

Job	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration (days)	15	15	3	5	8	12	1	14	3	14

i. Draw an arrow diagram representing the project.
ii. Find the total float for each activity.
iii. Find the critical path and the total project duration.

3.e. A T.V. mechanic 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 come in. If the arrived 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 in? (CO5) 5

SECTION C **20**

4. Answer any <u>one</u> of the following:-

4-a. Discuss the various steps used in solving Operations Research problems. (CO1) 4

4-b. Discuss the applications of OR and give some examples. (CO1) 4

5. Answer any <u>one</u> of the following:-

5-a. Solve the following LP problem by Simplex Method: (CO2) 4

Maximize $Z = 3x_1 + 2x_2$

Subject to $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

and $x_1, x_2 \geq 0$

5-b. Solve the following LPP by using graphical method: (CO2) 4

Max. $Z = 6x_1 + 4x_2$

subject to $-2x_1 + x_2 \leq 2$

$x_1 - x_2 \leq 2$

$3x_1 + 2x_2 \leq 9$

$x_1, x_2 \geq 0$

6. Answer any <u>one</u> of the following:-

6-a. Obtain an initial basic feasible solution to the following transportation problem by using matrix minima method. (CO3) 4

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	2	2	1	10
Demand	4	6	8	6	

6-b. What are the job-assignment which will minimize the cost? (CO3) 4

	W	X	Y	Z
A	18	24	28	32
B	8	13	17	18
C	10	15	19	22

7. Answer any <u>one</u> of the following:-

7-a. Define PERT and also define the optimistic, pessimistic and most likely time estimates. (CO4) 4

7-b. It is given that the set-up cost is Rs. 100, the daily holding cost per unit of inventory is 5 paise and the daily demand is approx. 30 units. Determine the: (CO4) 4

i. Economic lot size
ii. The associated total cost.

8. Answer any <u>one</u> of the following:-

8-a. State the major reasons of using simulation and discuss its scope. (CO5) 4

8-b. Define Queuing Theory. In what type of situations it can be applied successively? Discuss with examples. (CO5) 4