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. Operations Research approach is typically based on the use of (CO1) 1

(a) Physical model
(b) Mathematical model
(c) lconic model
(d) Descriptive model

1-b. Non-negativity condition is an important component of LP model because (CO2) 1

(a) Variable's value should remain under the control of decision maker
(b) Value of variables make sense and correspond to real world problems
(c) Variables are interrelated in terms of limited resources
(d) None of the above

1-c. The solution to a transportation problem with 'm' rows(supplies) and 'n' columns(destination) is feasible if number of positive allocations are (CO3) 1

(a) m+n
(b) mn
(c) m+n-1
(d) m+n+1

1-d. ..... costs can vary with order quantity. (CO4) 1

(a) Holding cost only
(b) Re-order cost only

(c) Unit cost only

(d) All of these

1-e. The main purpose of using simulation technique is to (CO5) 1

(a) Simulate a real world situation

(b) Reduce the cost of experiment on a model of real situation

(c) Understand properties and operating characteristics of complex real life problems

(d) None of the above

2. Attempt all parts:-

2.a. Discuss the objectives of Operations Research. (CO1) 2

2.b. Write dual form of the following LPP (CO2) 2

$$\text{Max. } z = 6x_1 + 4x_2$$

s.t. $2x_1 + 3x_2 \leq 120,\ 2x_1 + x_2 \leq 60, x_1, x_2 \geq 0$

2.c. Define degeneracy in transportation problem? (CO3) 2

2.d. Describe the three common errors in the construction of network? (CO4) 2

2.e. Define random number. (CO5) 2

SECTION-B 15

3. Answer any three of the following:-

3-a. Define a mathematical model of real situation. Discuss the importance of models in the solution of Operational Research problems? (CO1) 5

3-b. Solve the following LPP by Dual Simplex Method : (CO2) 5

Max $z = -3x_1 - x_2$

Subject to $x_1 + x_2 \geq 1$

$2x_1 + 3x_2 \geq 2$

and $x_1, x_2 \geq 0$

3.c. Solve the following assignment problem:(CO3) 5

		Jobs			
		A	B	C	D
Machines	1	9	14	19	15
	2	7	17	20	19
	3	9	18	21	18
	4	10	12	18	19
	5	10	15	21	16

3.d. The following table shows the jobs of a network along with their time estimates. The time estimates are in days. (CO4) 5

Job	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
a	3	2	6	2	5	3	1	3	4

m	6	5	12	5	11	6	4	9	19
b	15	14	30	8	17	15	7	27	28

i. Draw the project network.
ii. Find the critical path and total project duration.

3.e. In a public telephone booth, the arrivals on an average are 15 per hour. A call on an average takes three minutes. If there is just one phone, find (i) the expected number of callers in the booth at any time (ii) the proportion of the time, the booth is expected to be idle? (CO5) 5

SECTION-C 20

4. Answer any one of the following:-

4-a. Write a note on historical development of Operations Research. (CO1) 4

4-b. Define OR and Discuss the various phases in solving an OR problem. (CO1) 4

5. Answer any one of the following:-

5-a. A company manufactures two types of boxes, corrugated and ordinary cartons. The boxes undergo two major processes: cutting and pinning operations. The profits per unit are Rs. 8 and Rs. 4 respectively. Each corrugated box requires 3 minutes for cutting and 6 minutes for pinning operation, whereas each carton box requires 4 minutes for cutting and 1 minute for pinning. The available operating time is 60 minutes and 120 minutes for cutting and pinning machines. Formulate the LPP and solve graphically. (CO2) 4

5-b. Show that $C = \{(x, y) : 2x+3y = 7\} \subset R^2$ is a convex set. (CO2) 4

6. Answer any one of the following:-

6-a. Define transportation problem. Distinguish between Assignment problem and transportation problem. (CO3) 4

6-b. A company has three plants A,B and C and three warehouse X,Y and Z. Number of units available at the plants is 60,70 and80,respectively.Demands at X,Y and Z are50,80 and 80,respectively.Units costs of transportation are as follows: (CO3) 4

	X	Y	Z
A	8	7	3
B	3	8	9
C	11	3	5

Find initial solution of transportation problem by using VAM. Give minimum distribution cost.

7. Answer any one of the following:-

7-a. Define critical path method (CPM) and Programme evaluation and review technique (PERT) Write down the difference between PERT and CPM. what particular advantages does PERT have over CPM? (CO4) 4

Question Instruction

7-b.	Define Inventory and also discuss different types of inventories. (CO4)	4
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 system. Describe the fundamental components of a queueing process and give suitable examples.(CO5)	4