UTE OF TECHNO MCA Library

CBCS SCHEME

USN

21ME753

Seventh Semester B.E. Degree Examination, Dec.2025/Jan.2026
Operation Research

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Briefly explain the phases of OR study. **(06 Marks)**

b. A company produces two products A and B which possess raw material of 500 quintals and 550 labour hours. It is known that 1 unit of product 'A' requires 6 quintals of materials and 11 man hours and yields profit of Rs 55. Product 'B' requires 30 quintals of materials, 25 man hours and yields a profit of Rs 85. Formulate the LPP and find the number of products to be produced. **(14 Marks)**

OR

2 a. What is Operation Research? What are its characteristics? **(06 Marks)**

b. A person has to provide 10 ,12 and 12 units of chemicals A, B and C respectively to his garden. A liquid product contains 5 , 2 and 1 unit of chemical A , B and C respectively per jar and cost Rs 3 per jar. A dry product contains 1 , 2 and 4 units of chemicals A , B , C respectively per packet and cost Rs 2 per packet. How many of these the person should purchase to meet the requirements at least cost? Formulate as an LPP and solve graphically. **(14 Marks)**

Module-2

3 a. Define Slack , Surplus variable used in Simplex method. **(06 Marks)**

b. Solve the below LPP by Simplex Method. **(14 Marks)**

$Z_{MAX} = 5x_1 + 3x_2$

Subjected to $x_1 + x_2 \le 2$

$5x_1 + 2x_2 \le 10$

$3x_1 + 8x_2 \le 12$

$x_1 , x_2 \ge 0.$

OR

4 a. What is degeneracy in Simplex method? How to overcome it? **(06 Marks)**

b. Solve the below problem (LPP) by BIG – M method. **(14 Marks)**

$Z_{max} = 2x_1 + 3x_2 + 4x_3$

Sub. to $x_1 + x_2 + x_3 \le 1$

$x_1 + x_2 + 2x_3 = 2$

$3x_1 + 2x_2 + x_3 \ge 4$

$x_1 , x_2 , x_3 \ge 0.$

Module-3

5 a. What are the characteristics of assignment technique / model / problems? (06 Marks)

b. A company has 5 jobs to be done on 5 machines. Any job can be done on any machine. The cost of doing the jobs on different machines is given below. Assign the jobs for different machines so as to minimize the total cost (14 Marks)

MACHINES

JOBS	A	B	C	D	E
1	13	8	16	18	19
2	9	15	24	9	12
3	12	9	4	4	4
4	6	12	10	8	13
5	15	17	18	12	20

OR

6 a. What is the nature of Transportation problem? (06 Marks)

b. A company has 3 plants and 4 destinations , unit transportation cost is shown below. Find the optimum cost. (14 Marks)

TO

FROM	P	Q	R	S	SUPPLY
A	21	16	25	13	11
B	17	18	14	23	13
C	32	17	18	41	19
DEMAND	6	10	12	15	

Module-4

7 a. Explain the significance of PERT & CPM technique. (06 Marks)

b. A project has 9 activities. Below table shows the time in days for each activity and predecessor relation between activities. Find (14 Marks)

i) Draw the network diagram

ii) Project completion time

iii) What is the critical path

Activity	A	B	C	D	E	F	G	H	I
Predessor	-	-	-	A	A	BD	C	BD	FG
Time	23	8	20	16	24	18	19	4	10

OR

8 a. How Que's are distinguished using KENDAL rotation? (06 Marks)

b. Customer arrive to a bank with mean of 10 per hour in Poission distribution. The customers are served with a mean of 5 minutes. Determine (14 Marks)

i) What is the probability that customer directly served?

ii) How many customers are waiting in the bank?

iii) What is the time a customer need to come out of the bank?

iv) What is the probability that there are 10 customers in the queue?

Module-5

9 a. Define the term i) PURE strategy ii) MAX – MIN Criteria. (06 Marks)

b. Solve the below game by Dominance rule. Player A's pay off matrix is given below :

PLAYER - B

PLAYER - A	I	II	III	IV
1	1	-2	1	2
2	-1	3	2	0
3	-1	-2	3	4
4	-4	-2	2	3

(14 Marks)

OR

10 a. What is Sequencing? What are the assumptions to be made in sequencing technique? (06 Marks)

b. A garments manufacturing has 7 jobs to be processed on cutting , sewing , pressing machines. The time for each stages is shown below. Find the sequence with total elapsed time and idle time. (14 Marks)

JOBS →	1	2	3	4	5	6	7
Cutting	5	7	3	4	6	7	12
Sewing	2	6	7	5	9	5	8
Pressing	10	12	11	13	12	10	11

* * * * *