CBCS SCHEME

USN | | | | | | | | | | |

17ME81

Eighth Semester B.E. Degree Examination, Feb./Mar. 2022
Operations Research

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define Operations Research. List and explain briefly various phases of operations research. **(10 Marks)**

b. A factory manufactures a product each unit of which consists of 5 units of part A and 4 units of part B. The two parts A and B require different raw materials of which 120 units and 240 units respectively are available. These parts can be manufactured by three different methods. Raw material requirements per production run and the number of units for each part produced are given below:

Method	Input per run (units)		Output per run (units)	
	Raw material 1	Raw material 2	Part A	Part B
1	7	5	6	4
2	4	7	5	8
3	2	9	7	3

Formulate the LP model to determine the number of production runs for each method so as to maximize the total number of complete units of the final product. **(10 Marks)**

OR

2 a. Explain the limitations of operations research. **(08 Marks)**

b. Solve the following LPP by graphical method and indicate the solution:

Maximum value of $Z = 2x_1 + 3x_2$

Subject to $x_1 + x_2 \le 30$

$x_2 \ge 3$

$x_2 \le 12$

$x_1 - x_2 \ge 0$

$0 \le x_1 \le 20$ **(12 Marks)**

Module-2

3 a. Define slack variable, surplus variable and artificial variable. **(06 Marks)**

b. Solve the following by Big-M method:

Minimize $Z = 2x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \ge 6$

$x_1 + 2x_2 \le 3$

$x_1, x_2 \ge 0$ **(14 Marks)**

OR

4 a. Solve the following by simplex method for given LPP:

Maximize $Z = 4x_1 + 10x_2$

Subject to $2x_1 + x_2 \le 10$

$2x_1 + 5x_2 \le 20$

$2x_1 + 3x_2 \le 18$

$x_1, x_2 \ge 0$ **(10 Marks)**

b. Solve the following LPP by Dual Simplex Method.

Minimize $Z = 3x_1 + x_2$

Subject to $x_1 + x_2 \ge 1$

$2x_1 + 3x_2 \ge 2$

$x_1, x_2 \ge 0$ **(10 Marks)**

Module-3

5 a. Write a brief note on Degeneracy in Transportation Problem. **(08 Marks)**

b. Find the initial feasible solution to the transportation problem given below by North West Corner Rule and Least Cost Method. **(12 Marks)**

Demand

	D_1	D_2	D_3	D_4	Supply
S_1	2	3	11	7	6
S_2	1	0	6	1	1
S_3	5	8	15	9	10
	7	5	3	2	

OR

6 a. Solve the following transportation problem by using VAM technique. **(08 Marks)**

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	4	2	3	2	6	8
S_2	5	4	5	2	1	12
S_3	6	5	4	7	3	14
Demand	4	4	6	8	8	

b. Solve the following problem by MODI method (apply N-W corner rule for initial basic feasible solution) **(12 Marks)**

	D_1	D_2	D_3	Supply
S_1	2	7	4	5
S_2	3	3	1	8
S_3	5	4	7	7
S_4	1	6	2	14
Demand	7	9	18	

Module-4

7 a. Define dummy activity in network analysis. Explain in brief AON and AOA diagrams. **(08 Marks)**

b. Consider the following activity of a project:

Activity	A	B	C	D	E	F
Predecessor	–	A	A	B, C	–	E
Duration (weeks)	2	3	4	6	2	8

Draw the network diagram and find critical path and project duration. **(12 Marks)**

OR

8 a. Explain the following:
 (i) Kendall's notation for representing queueing models.
 (ii) Pure birth process
 (iii) Pure death process **(08 Marks)**

b. A self service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate, find:
 (i) Average number of customers in the system
 (ii) Average number of customers in queue
 (iii) Average time a customer spends in the system
 (iv) Average time a customer waits before being served. **(12 Marks)**

Module-5

9 a. Apply the rules of dominance to reduce the game to (2×2) and solve the game to obtain game value and optimum strategies for both the players. **(10 Marks)**

	1	2	3	4
1	3	2	4	0
2	2	4	3	4
3	4	2	4	0
4	0	4	0	8

b. Solve the following (2×4) game graphically: **(10 Marks)**

		Player B			
		1	2	3	4
Player A	1	2	2	3	−1
	2	4	3	2	6

OR

10 a. Find the sequence for the following eight jobs that minimizes the total elapsed time for completion of all jobs, each job being processed in the order CAB. Find the total elapsed time and idle time of each machine.

		Jobs							
		1	2	3	4	5	6	7	8
Machines	A	4	6	7	4	5	3	6	2
	B	8	10	7	8	11	8	9	13
	C	5	6	2	3	4	9	15	11

The entries give the time in hours on the machines. **(12 Marks)**

b. State the assumptions made while applying Johnson's rule to n jobs on 2 machines. **(08 Marks)**

* * * * *