U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E.   Semester: VII
Branch: Institutional Elective   Duration: 3 hrs.
Course Code: 21MD7OEOPR   Max Marks: 100
Course: Operations Research

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may suitably assumed.
3. Standard normal cumulative probability table are permitted.

UNIT - I

1 a) Young ducks can be brought at Rs. 100/-each and Old ducks Rs. 50/- each. **10**
The old ducks lay 3 eggs /week, whereas young ducks lay 5 eggs/week. Each
egg cost Rs 2. It costs Rs 5 /week to feed a duck, if the farm owner has only Rs.
2000 to spend for the duck, Formulate problem to decide how many of each
kind of ducks should he buy ? And he cannot house more than 40 ducks,
Formulate LPP model.

b) Using graphical method, solve the following LPP   **10**

Maximize $Z = 3x_1 + 5x_2$,

Subjected to $x_1 + 2x_2 \leq 2000$,

$\qquad x_1 + x_2 \leq 1500$,

$\qquad x_2 \leq 600$ and $x_1 \geq 0, x_2 \geq 0$

OR

2 a) A oil processing industry wants to find optimal mix of two blending processes. **08**
Formulate LPP for the Data:

	Input (Crude Oil)		Output(Gasoline)	
	Quality A	Quality B	x	y
P1	6	4	6	9
P2	5	6	5	5

Profit per operation: Process 1 (P1) = ₹ 4, 000 and Process 2 (P2) = ₹ 5,000.
Maximum availability of crude oil: Quality A = 500 units and Quality B = 400
units
Minimum Demand for Gasoline: X = 300 units and Y = 200 units.

b) A Foundry produces the two types of piston castings, Piston A and Piston B. **12** Each piece of Piston A requires 9 labour hours for casting and 1 labour hour for finishing. Each piece of Piston B requires 12 labour hours for casting and 3 labour hours for finishing. For Casting and finishing, the maximum labour hours available are 180 and 30 respectively. The Foundry makes a profit of ₹ 8000 on each piece of piston A and ₹ 12000 on each piece of piston B. By using the graphical method find how many pieces of piston A and piston B should be manufactured per week to realize a maximum profit? What is the maximum profit per week?

UNIT - II

3 a) Discuss unbalanced problem in transportation and its cause? How it can be overcome? **06**

b) Solve the following Transportation problem for optimality. **14**

		Destination				
		P	Q	R	S	Supply
Source	A	21	16	25	13	11
	B	17	18	14	23	13
	C	32	17	18	41	19
	Demand	6	10	12	15	43

UNIT - III

4 a) An industrial unit has Five 3D Printers available to do jobs for the day. Five **10** jobs are offered with expected profit for each 3D Printer on each job as follows. Find the assignment of 3D printers to jobs that will result in a maximum profit.

3D Printer → / Job ↓	M1	M2	M3	M4	M5
A	5	11	10	12	4
B	2	4	6	3	5
C	3	12	5	14	6
D	6	14	4	11	7
E	7	9	8	12	5

b) The processing time (in hrs) of 7 jobs to be processed on 3 machines M1, M2, and M3 in the order M1, M2 and M3 is given in the table. Sequence these jobs using Johnson's method and find the overall processing time and idle time for the machines. **10**

	Time required for the Job (in Hrs)						
	A	B	C	D	E	F	G
M1	1	3	7	9	4	5	2
M2	7	3	8	2	8	6	1
M3	8	10	9	11	9	14	12

UNIT - IV

5 a) A project has the following times schedule: **10**

Activity	1-2	1-3	1-4	2-6	3-7	3-5	4-5	5-9	6-8	7-8	8-9
Time (Days)	2	2	1	4	5	8	3	5	1	4	3

Construct PERT network and compute
i) Earliest event time and latest event time **ii)** Total float and free float

b) A project has the following characteristics. Construct a PERT network. Find critical path and variance for each event. Find the project duration at 95% probability. **10**

Activity	Most optimistic time	Most pessimistic time	Most likely time
1 − 2	1	5	1.5
2 − 3	1	3	2
2 − 4	1	5	4
3 − 5	3	5	4
4 − 5	2	4	3
4 − 6	3	7	5
5 − 7	4	6	5
6 − 7	6	8	7
7 − 8	2	6	4
7 − 9	5	8	6
8 − 10	1	3	2
9 - 10	3	7	5

OR

6   a)   With necessary sketches, explain the common errors in drawing network diagram.   **06**

    b)   A project schedule has the following characteristics   **10**

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time(days)	4	1	1	1	6	5	4	8	1	2	5	7

From the above information, you are required to
(i)   Construct a network diagram
(ii)   Compute the earliest event time and latest event time
(iii)   Determine the critical path and total project duration.
(iv)   Compute total and free float for each activity
(v)

    c)   Explain **i)** Critical path   **ii)** Crashing   **04**

UNIT - V

7   a)   Explain the following terms: **08**
        Saddle point (ii) Principle of dominance (iii) Pure strategy (iv) payoff matrix.

    b)   Solve the following game by graphic method   **12**

		Player B			
		I	II	III	IV
Player A	I	2	2	3	-1
	II	4	3	2	6

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