22/01/25

Code No.: R22CS58315OE | R22 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–M.TECH–I–Semester End Examinations (Regular) - January- 2025
OPERATIONS RESEARCH (OE)
(VLSI SD)

[Time: 3 Hours] **[Max. Marks: 60]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 10 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A **(10 Marks)**

1. a)	Why is sensitivity analysis important in decision-making?	[1M]
b)	Define inventory control.	[1M]
c)	Define infeasible solution.	[1M]
d)	Write one real-world application of dual simplex method.	[1M]
e)	How does nonlinear programming differ from linear programming?	[1M]
f)	List the major differences between PERT and CPM.	[1M]
g)	Name the algorithm used for solving a sequencing model problem.	[1M]
h)	Define the term "idle time" in scheduling.	[1M]
i)	How can dynamic programming solve network flow problems?	[1M]
j)	Define "dominant strategy" in the context of game theory.	[1M]

PART-B **(50 Marks)**

2. What do you mean by sensitivity analysis? Discuss sensitivity analysis with respect to (i) Change in the constraint matrix (ii) Addition of a new constraint. [10M]

OR

3. The weekly demand of a certain product follows a normal distribution with a mean of 500 units and a standard deviation of 100 units. The lead time is 2 weeks, and the company desires a 95% service level. Determine: (i) The reorder point and (ii) The safety stock. [10M]

4. Solve the following problem by the graphical method. [10M]
Maximize $Z = 2X_1 + 2X_2$
Subject to
$5X_1 + 2X_2 \geq 10$
$X_1 + X_2 \leq 5$
$2X_1 + 5X_2 \geq 10$
$0 \leq X_1 \leq 4$
$0 \leq X_2 \leq 4$

OR

5. Consider the following problem where the initial solution is infeasible. Use the dual simplex method to solve: [10M]
Minimize $Z = X_1+2X_2$
subject to
$2X_1+X_2 \leq 6$
$X_1+X_2 \geq 5$
$X_1, X_2 \geq 0$

6. Use the Kuhn-Tucker conditions to determine X_1, X_2 and X_3 so as to maximize
$Z = -X_1^2 - X_2^2 - X_3^2 + 4X_1 + 6X_2$
subject to
$X_1 + X_2 \leq 2$
$2X_1 + 3X_2 \leq 12$
and $X_1, X_2 \geq 0$ [10M]

OR

7. A project has the following characteristics. Construct a PERT network. Find the critical path and variance for each event.

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	3
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

[10M]

8. A company has to process five items on three machines A, B and C. Processing times are given in the following table:

Item	A_i	B_i	C_i
1	4	4	6
2	9	5	9
3	8	3	11
4	6	2	8
5	3	6	7

[10M]

Find the sequence that minimizes the total elapsed time.

OR

9. Minimize $Z = X_1X_2^2 X_3^{-1} + 2X_1^{-1} X_2^{-3} X_4 + 10X_1 X_3$
Subjected to
$3X_1^{-1} X_3^{-2} X_4^{-2} + 4X_3 X_4 \leq 1$
$5 X_1 X_2 \leq 1$
Solve the geometric programming problem [10M]

10. Apply the dynamic programming to solve the following problem.
Minimize $f(y) = x_1^2+x_2^2+x_3^2$
$x_1+x_2+x_3 \geq 12$
$x_1, x_2, x_3 \geq 0$ [10M]

OR

11. Solve the game whose payoff matrix is given below

	B_1	B_2	B_3	B_4	B_5	B_6
A_1	1	3	-1	4	2	-5
A_2	-3	5	6	1	2	0

[10M]

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