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

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–M.TECH–I–Semester End Examinations (Regular) - Feb- 2024
OPERATIONS RESEARCH
(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) State the basic assumptions of Linear Programming Problem formulations. [1M]
   b) Define slack variable. [1M]
   c) State sensitivity analysis. [1M]
   d) Define infeasible solution. [1M]
   e) State the Kuhn-Tucker conditions. [1M]
   f) Explain the following terms. [1M]
   (i) Pessimistic time, (ii) Expected time.
   g) Give one application of sequencing model. [1M]
   h) List the various elements of queuing system. [1M]
   i) How is dynamic programming problem different from LPP. [1M]
   j) What are the underlying assumptions of game theory? [1M]

PART-B **(50 Marks)**

2. A company produces two types of leather belts say type A and B. Belt A is a superior quality and belt B is of a lower quality. Profits on each type of belt are 2 and 1.50 per belt, respectively. Each belt of type A requires twice as much time as required by a belt of type B. If all belts were of type B, the company could produce 1000 belts per day. But the supply of leather is sufficient only for 800 belts per day (both A and B combined). Belt A requires a fancy buckle and only 400 fancy buckles are available for this per day. For belt of type B, only 700 buckles are available per day. How should the company manufacture the two types of belts in order to have a maximum overall profit? [10M]

OR

3. Solve the following LP Problem [10M]
   Maximize $Z = 5X_1 + 2X_2$
   Subject to
   $2X_1 + 7X_2 \leq 100$
   $3X_1 + 8X_2 \leq 135$ and
   $X_1, X_2 \geq 0$

4. Solve the following problem by the graphical method. [10M]
Maximize $Z = 2x_1 + 2x_2$
Subject to
$5x_1 + 2x_2 \geq 10$
$x_1 + x_2 \leq 5$
$2x_1 + 5x_2 \geq 10$
$0 \leq x_1 \leq 4$
$0 \leq x_2 \leq 4$

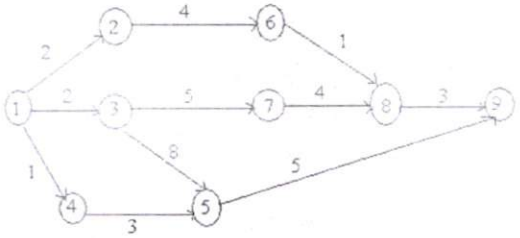
OR

5. Use two-phase simplex method to solve the following LPP : Minimize $Z = X_1 - 2X_2 - 3X_3$ [10M]
subject to
$-2X_1 + X_2 + 3X_3 = 2$,
$2X_1 + 3X_2 + 4X_3 = 1$ &
$X_1 \geq 0, X_2 \geq 0, X_3 \geq 0$.

6. Use the Kuhn-Tucker condition to solve the following. [10M]
Maximize $Z=8x_1^2+2x_2^2$
Subject to
$x_1^2+x_2^2 \leq 9$
$x_1 \leq 2$
$x_1 \geq 0, \ x_2 \geq 0$

OR

7. Find the critical path and calculate the slack time for the following network [10M]



8. Find the sequence that minimizes the total elapsed time (in hours) required to complete the following tasks on two machine. L3

Task	A	B	C	D	E	F	G	H	I
Machine I	2	5	4	9	6	8	7	5	4
Machine II	6	8	7	4	3	9	3	8	11

OR

9. Ram industry needs 5400 units/years of a bought – out component which will be used in its mean product. The ordering cost is Rs. 250 per order and the carrying cost per unit per year is Rs. 30. Find the economic order quantity, the number of orders per year and time between successive orders. [10M]

10. Apply the dynamic programming to solve the following problem: [10M]
Maximize $f(x)=5x_1+10x_2$
$10x_1+5x_2 \leq 250$
$4x_1+10x_2 \leq 200$
$2x_1+3x_2 \leq 900$
$x_1 \geq 0, \ x_2 \geq 0$

OR

11. (i) Solve the following (2x4) game graphically [8M]
[2M]

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

Explain rule of Dominance

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