Code No.: MAZ01OE | R20 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–M.TECH–I–Semester End Examinations (Regular) - Feb- 2022
OPERATIONS RESEARCH (OE)
(Common for VLSI SD & CSE)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 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 **(20 Marks)**

1. a) Explain phases of operations research. [2M]
   b) Discuss the Basic Solution and Unbounded Solution. [2M]
   c) What is meant by degeneracy in linear programming? [2M]
   d) Define solution to LPP. [2M]
   e) Write the Kuhn-Tucker conditions. [2M]
   f) Define PERT. [2M]
   g) Write the mathematical equation for EOQ. [2M]
   h) Distinguish between breakdown maintenance and preventive maintenance. [2M]
   i) State applications of dynamic programming. [2M]
   j) What is pure strategy? [2M]

PART-B **(50 Marks)**

2. An engineering college needs 22 to 30 professors/lecturers daily depending on the teaching loads and lab work distributions. The requirements are as follows: [10M]

Time Period	Number of professors needed
9 am to 11am	22
11am to 1pm	30
1 pm to 3 pm	25
3 pm to 5 pm	23

Due to scarcity of qualified people, the college has employed 20 staff members only on permanent rolls and hence needs some part-time professors, too. The part-time professors must put in exactly 4 hours per day and can start at one of the starting times, i.e. 9 am, 11 am or 1 pm. Permanent employees (full-time lecturers) work from 9 am to 5 pm but are allowed one hour lunch and one hour leisure breaks. Assume that half of the full-time lecturers take lunch and leisure breaks between 11 am and 1 pm and the other half between 1 pm and 3 pm, but part-timers have to work continuously for four hours from their starting time. The university limits the college to engage part-time hours to a maximum of 50% of the day's total requirement. Part-timers earn 300 per day while full-timers earn 900 in salary along with other benefits. The management has to set a schedule so as to minimize the total daily manpower costs. Give the formulation only

OR

3. Old hens can be bought at Rs.20 each and young ones at Rs.50 each. The old hens lay 3 eggs per week and young ones lay 5 eggs per week each egg being worth Rs. 3. A hen (young or old) costs Rs.3 per week to feed. I have only Rs.1000 to spend for hens. How many of each kind should I buy to give a profit of more than Rs.60 week assuming that I cannot house more than 20 hens. Formulate and solve it simplex method [10M]

4. Max $Z= 5\ x_1+12\ x_2+4x_3$ [10M]
Subjected to
$x_1+2\ x_2+x_3 \leq 5$
$2x_1-\ x_2+3x_3 \leq 2$
$x_1,x_2,x_3 \geq 0$
Solve the L.P.P and find the effect of changing Z to (4, 10, 4) from (5, 12, 4) using sensitivity analysis

OR

5. Use the degeneracy principles to solve the following LPP. [10M]
Maximize $Z= 5\ x_1+8\ x_2$
Subjected to
$x_1+4x_2 \leq 8$
$x_1+2x_2 \leq 4$
$x_1,x_2 \geq 0$

6. Using the Kuhn-Tucker conditions, solve the following [10M]
Non-LP problem:
Maximize $Z=2x_1-x_1^2+x_2$
Subject to $2x_1+3x_2 \leq 6$
$2x_1+x_2 \leq 4$
$x_1,x_2 \geq 0$

OR

7. Use the method of Langrangian multipliers to solve the following non-LP problem. Does the solution maximize or minimize the objective function? [10M]

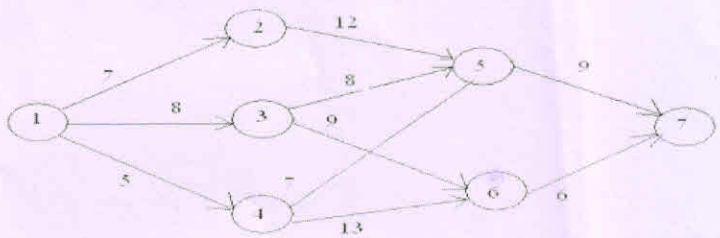
$f(x)=2x_1^2+x_2^2+3x_3^2+10\ x_1+8\ x_2+6x_3-10$
Subject to $g(x)= x_1+x_2+x_3=20$
$x_1,x_2,x_3 \geq 0$

8. The annual demand for an automobile component is 36,000 units. The carrying cost is Rs.0.50 per unit per year, the ordering cost is Rs.25 per order and the shortage cost is Rs.15 per unit per year. Find the optimal values of the following i) Economic order quantity ii) Maximum inventory iii) Cycle time. [10M]

OR

9. a) Write the different types of basic deterministic inventory models? [2M]
b) Derive EOQ model with uniform demand and its assumptions. [8M]

10. Select the shortest highway route between two cities. The network in fig: provides the possible routes between the starting city at node 1 and destination city at node 7. [10M]



OR

11. Solve the game with the following pay-off matrix. [10M]

Player B

Player A		I	II	III	IV	V
	1	-2	5	-3	6	7
	2	4	6	8	-1	6
	3	8	2	3	5	4
	4	15	14	18	12	20

Find (i) Game value
(ii) Best strategy for Player A
(iii) Best strategy for Player B
and (iv) whom will have the favorable

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