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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2021 ONLY)

21UMS408

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : MAY-2023

COURSE NAME: B.Sc.-MATHEMATICS **MAXIMUM MARKS: 70**

SEMESTER: IV **TIME : 3 HOURS**

PART - III

21UMS408 – OPERATIONS RESEARCH – I

SECTION - A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

MULTIPLE CHOICE QUESTIONS. (K1)

1. LPP Involving _____ decision variables can easily be solved by graphical method.

   a) three b) two c) one d) four

2. A feasible solution to an LPP which is also a basic solution to the problem is called _____ feasible solution to the LPP.

   a) basic b) optimum c) bounded d) optimum basic

3. The Dual of the Dual is _____.

   a) dual b) inverse c) primal d) feasible

4. There always exists an _____ solution to a Transportation Problem.

   a) feasible b) non feasible c) optimum d) bounded

5. The assignment problem can be solved by _____ Method.

   a) Simplex b) Hungarian c) Simpson's d) Trapezoidal

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)

6. Define LPP.
7. Define Surplus variable.
8. Define primal problem in LPP.
9. Define an unbalanced transportation problem.
10. Write the TOTAL COST formula in Replacement Model.

SECTION – B (5 X 4 = 20 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Explain the Mathematical formulation of L.P.P.

(OR)

b) Rewrite in standard form of the following L.P.P:
Minimize $Z = 2x_1 + x_2 + 4x_3$ subject to the constraints
$-2x_1 + 4x_2 \leq 4$, $x_1 + 2x_2 + x_3 \geq 5$, $2x_1 + 3x_3 \leq 2$ and $x_1, x_2 \geq 0$.

(CONTD…..2)

12.a) Obtain all basic feasible solutions to the following system of linear equation

$x_1 + 2x_2 + x_3 = 4,\ 2x_1 + x_2 + 5x_3 = 5$

(OR)

b) Apply Simplex method to solve the L.P.P

Maximize $Z = 4x_1 + 10x_2$ subject to the constraints

$2x_1 + x_2 \leq 50,\quad 2x_1 + 5x_2 \leq 100,\ 2x_1 + 3x_2 \leq 90$ and $x_1, x_2 \geq 0$.

13.a) Find the dual of the following L.P.P

Maximize $Z = 5x_1 + 3x_2$ subject to the constraints

$3x_1 + 5x_2 \leq 15,\quad 5x_1 + 2x_2 \leq 10$ and $x_1, x_2 \geq 0$.

(OR)

b) State and prove Existence Theorem in Duality.

14.a) Find the starting solution (IBFS) of the following transportation model by NWC rule.

				Supply
	1	2	6	7
	0	4	2	12
	3	1	5	11
Demand	10	10	10	

(OR)

b) Obtain the IBFS to the following transportation problem using MMM (Least Cost Method)

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirements	200	225	275	250	

15. a) Solve the following Assignment Problem

	E	F	G	H
A	1	4	6	3
B	9	7	10	9
C	4	5	11	7
D	8	7	8	5

(OR)

b) The cost of a new machine is Rs 5000. The maintenance cost of n^{th} year is given by $C_n = 500\ (n-1)$; n= 1, 2, 3 … . Suppose that the discount rate per year is 0.05. After how many years will it be economical to replace the machine by a new one?

SECTION - C **(4 X 10 = 40 MARKS)**

ANSWER ANY FOUR OUT OF SIX QUESTIONS

(16^{th} QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS (FROM Qn. No : 17 to 21) **(K4 (Or) K5)**

16. Machine A costs Rs. 9000. Annual operating costs are Rs. 200 for the first year, and then increase by Rs. 2000 every year. Machine B costs Rs.10000. Annual operating costs are Rs.400 for the first year, and then increase by Rs. 800 every year. Find the best replacement policy for both the machine.

(CONTD…..3)

17. Determine the solution for the following L.P.P by using Graphical Method
Maximize $Z = 3x_1 + 2x_2$ subject to the constraints
$-2x_1 + x_2 \leq 1$, $x_1 \leq 2$, $x_1 + x_2 \leq 3$ and $x_1, x_2 \geq 0$.

18. Determine the solution for the following L.P.P by using Big M method,
Maximize $Z = 6x_1 + 4x_2$ subject to the constraints
$2x_1 + 3x_2 \leq 30$, $3x_1 + 2x_2 \leq 24$, $x_1 + x_2 \geq 3$ and $x_1, x_2 \geq 0$.

19. Determine the solution for the following L.P.P by using duality.
Maximize $Z = 2x_1 + x_2$ subject to the constraints
$x_1 + 2x_2 \leq 10$, $x_1 + x_2 \leq 6$, $x_1 - x_2 \leq 2$, $x_1 - 2x_2 \leq 1$ and $x_1, x_2 \geq 0$.

20. Find the IBFS by VAM method and hence find the optimum solution to the following transportation problem.

				Supply
	7	3	2	2
	2	1	3	3
	3	4	6	5
Demand	4	1	5	

21. Determine the optimum assignment schedule for the following assignment problem

	1	2	3	4
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

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