QP CODE: D3BAM2402	**(Pages: 3)**	**Reg. No**	**:**	**...............................**
		Name	**:**	**...............................**

THIRD SEMESTER FYUGP EXAMINATION, NOVEMBER 2025

Discipline Specific Core (DSC) Courses - Major

AMA3CJ202 : Linear Programming and Applications

(Credits: 4)

Time: 2 Hours | **Maximum Marks: 70**

Section A

Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)

1. Define linear programming problem. Give an example of real life minimization linear programming problem. BL1 CO1

2. Convert the linear programming problem below to canonical form BL2 CO1
$Maximize\ P(x,y)=x+y,\ \ subject\ \ to\ x+2y\leq 3,\quad 2x+3y\geq 12,\quad 0\leq x\leq 4,\quad 0\leq y\leq 6$

3. BL2 CO2

x	-2	1	-3
y	1	-2	-2
-1	1	0	0
	$= t_1$	$= t_2$	$= g$

From the above Tucker tableau identify
a) Independent variables b) Dependent variables c) Slack variables

4. Pivot on 5 in the canonical maximum tableau below: BL3 CO2

x	1	2	3
y	4	5	6
-1	7	8	9
	$= t_1$	$= t_2$	$= g$

5. Write negative transpose of the following canonical minimization tableau: BL2 CO2

x	-2	1	-3
y	1	-2	-2
-1	1	0	0
	$= t_1$	$= t_2$	$= g$

6. Prove that for any pair of feasible solutions of dual canonical linear programming problems, we have $g\geq f$. BL1 CO3

7. Consider the canonical minimization linear programming problem below: BL1 CO3
$Minimize\ C(x,y)=300x+500y$
$subject\ to\ 20x+40y\geq 1000$
$25x+20y\geq 800$
$x,y\geq 0$
State the dual canonical maximization linear programming problem. **(PTO)**

8. Write steps of Vogel Advanced - Start method. BL1 CO4

9. Using minimum-entry method to obtain a basic feasible solution of the transportation problem given below : BL3 CO4

4	5	5
3	2	7
6	3	9
7	5	4
14	11	

10. Using northwest-corner method to obtain a basic feasible solution of the transportation problem given below : BL3 CO4

4	5	5
3	2	7
6	3	9
7	5	4
14	11	

Section B

Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)

11. Solve the following problem by sketching the constraint set BL3 CO1

$Minimize\ g(x,y) = 5x + 2y,\ \ subject\ \ to\ x + 3y \geq 14,\ \ 2x + y \geq 8,\ \ x, y \geq 0$

12. Graph the constraint set and show that the linear programming problem is infeasible; BL3 CO1

$Maximize\ f(x,y) = 3x + 2y,\ \ subject\ \ to\ 2x - y \leq -1,\ \ x - 2y \geq 0,\ \ x, y \geq 0$

13. Apply simplex algorithm to the maximum tableau; BL3 CO2

x_1	x_2	-1	
2	1	8	$= -t_1$
1	2	10	$= -t_2$
30	50	0	$= f$

14. Write simplex algorithm for canonical maximization linear programming problem. BL1 CO2

15. Consider the following LPP; BL3 CO3

$$
\begin{aligned}
&Maximize\ f(x_1, x_2) = x_1 \\
&Subject\ to\ \ x_1 + x_2 \leq 1 \\
&\qquad\qquad -x_2 - 2x_1 \geq 1 \\
&\qquad\qquad\quad x_1, x_2 \geq 0
\end{aligned}
$$

a) Draw the dual canonical tableau.

b) Solve the dual canonical linear programming problems.

16. Solve the dual canonical linear programming problems below: BL3 CO3

	x_1	x_2	-1	
y_1	1	2	20	$= -t_1$
y_2	2	2	30	$= -t_2$
y_3	2	1	25	$= -t_3$
-1	200	150	0	$= f$
	$= s_1$	$= s_2$	$= g$	

17. Solve the transportation problem below: BL3 CO4

12	10	8	28
8	9	11	62
20	38	22	

18. Solve the assignment problem below by using the Hungarian algorithm. BL3 CO4

2	3	2	4
5	8	4	3
5	9	5	2
7	6	7	4

Section C

Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)

19. Solve the canonical linear programming problem below by using the simplex algorithm with anticycling rules corresponding to the list x, y, t_1, t_2, t_3. BL3 CO2

x	y	-1	
3	2	1	$= -t_1$
-9	-2	0	$= -t_2$
3	1	0	$= -t_3$
3	2	1	$= f$

20. A manufacturer of widgits owns three warehouses and sells to three markets. The supply of each warehouse, the demand of each market, and the shipping cost per ton of widgits from each warehouse to each market are as follows: BL3 CO4

	Market 1	Market 2	Market 3	Supply
Warehouse 1	\$2/ton	\$1/ton	\$2/ton	40 tons
Warehouse 2	\$9/ton	\$4/ton	\$7/ton	60 tons
Warehouse 3	\$1/ton	\$2/ton	\$9/ton	10 tons
Demand	40 tons	50 tons	20 tons	

How should the manufacturer ship the widgits so as to minimize total transportation cost?

CO : Course Outcome

BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)