LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Com. DEGREE EXAMINATION – **ACCOUNTING AND FINANCE**

SECOND SEMESTER – **APRIL 2022**

UAF 2301 – ELEMENTS OF OPERATIONS RESEARCH

Date: 18-06-2022 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

	SECTION A			
	Answer ALL the Questions			
1.	**Define the following**		**(5 x 1 = 5 Marks)**	
a)	Unbalanced transportation problem		K1	CO1
b)	Pay off matrix		K1	CO1
c)	Assignment problem		K1	CO1
d)	Iconic model		K1	CO1
e)	Maximin		K1	CO1
2.	**Fill in the blanks**		**(5 x 1 = 5 Marks)**	
a)	The participants in the game are called _____		K1	CO1
b)	The intersection value of key column and key row is called _____		K1	CO1
c)	To find initial feasible solution of a transportation problem the method which starts allocation from the lowest cost is called _____.		K1	CO1
d)	If the value of the game is not equal to zero, the game is _____		K1	CO1
e)	When the solution is degenerate in transportation problem, we add a _____		K1	CO1
3.	**Match the following**		**(5 x 1 = 5 Marks)**	
a)	Non degeneracy	Column maximum	K2	CO1
b)	Minimax	LPP	K2	CO1
c)	Mixed Strategy	m+n-1= Allotments	K2	CO1
d)	Loss matrix	No Saddle point	K2	CO1
e)	Mathematical Formulation	Maximize Assignment	K2	CO1
4.	**TRUE or FALSE**		**(5 x 1 = 5 Marks)**	
a)	Operations Research cannot give perfect solution to problems.		K2	CO1
b)	Iconic models are called mathematical models		K2	CO1
c)	When the allocations of a transportation problem satisfy the condition (m + n – 1) the solution is called degenerate solution		K2	CO1
d)	Objective function is expressed is in the form of inequities or equations		K2	CO1
e)	In deterministic models there is risk and uncertainty		K2	CO1

SECTION B

Answer any TWO of the following in 150 words **(2 x 10 = 20 Marks)**

5. Two stores plan to run annual pre-Christmas sales during the second week of December. The matrix shows the percentage of market shares of the store A for its selection of different advertising media. Find the optimal strategies for both the stores and the value of the game

K3 CO2

STORE B

STORE A	Newspaper	Radio	Television
Newspaper	30	40	-80
Radio	0	15	-20
Television	90	20	50

6. Discuss the different types of models used in OR with examples. K3 CO2

7. Solve by simplex method the following LP problem: K3 CO2

Minimize $Z = x_1 - 3x_2 + 3x_3$,

Subject to the constraints,

$3x_1 - x_2 + 2x_3 \leq 7$,

$2x_1 + 4x_2 \geq -12$,

$-4x_1 + 3x_2 + 8x_3 \leq 10$,

$x_1, x_2, x_3 \geq 0$.

8. Linear programming has no real-life applications. Do you agree with this statement? Discuss K3 CO2

SECTION C

Answer any TWO of the following in 150 words **(2 x 10 = 20 Marks)**

9. Minimize, $Z = 8x - 2y$ subject to the constraints $-4x + 2y \leq 1$; $5x - 4y \leq 1$; x and $y \geq 0$. Solve by simplex method K4 CO3

10. A product is produced by three factories A, B, C, D. The unit production costs in them are Rs. 2, Rs. 3, Rs.1, Rs.5 respectively. Their production capacities of factory A is 50 units, B is 70 units, C is 30 units, D is 50 units. These factories supply the product to four stores, demands of which are 25, 35, 105, and 20 units respectively. Unit transport cost in rupees from each factory to each store is given in the table below: K4 CO3

Stores

Factories	W	X	Y	Z
A	2	4	6	11
B	10	8	7	5
C	13	3	9	12
D	4	6	8	3

	Determine the extent of deliveries from each of the factories to each of the stores so that the total production and transportation cost is minimum.		
11.	Indicate on a graph paper the region satisfying the following restraints. $x \geq 0, y \geq 0$ $12x + 12y \leq 840$ $3x + 6y \leq 300$ $8x + 4y \leq 480$ Under the above condition maximize the function $5x + 7y$	K4	CO3
12.	Consider the 4*4 game, which represents the payoff matrix of the player A. Solve it optimally. **PLAYER B** **PLAYER A** **I II III IV** **I** 25 20 14 30 **II** 27 16 12 14 **III** 35 8 15 19 **IV** -2 8 13 0	K4	CO3
	SECTION D		
Answer any TWO of the following in 250 words			**(2 x 20 = 40 Marks)**
13.	The advertising agency promoting the new super brand detergent powder wants to get the best exposure possible for the product within the Rs. 10,00,000 advertising budget ceiling placed upon it. To do so, the agency needs to decide how much of the budget to spend on each of its two most effective media: (i) Television spots during the afternoon hours, (ii) Large ads in city's Sunday newspaper Each television spot cost Rs.30,000; each Sunday newspaper ad costs Rs. 12,500. The expected exposure, based on industry ratings is 35,000 views for each TV commercial and 20,000 readers for each newspaper advertisement. The agency director knows from past experience that it is important to use both media in order to reach the broadest spectrum of potential customers. He decides that at least 5 but no more than 25 television spots should be ordered, and that at least 10 newspaper ads should be contracted. The agency wishes to determine how many times should each of the two media be used to obtain maximum exposure while staying within the budget? Formulate LPP model and solve graphically.	K5	CO4
14.	A firm produces three products. These products are processed on three	K5	CO4

different machines. The time required to manufacture one unit of each of the three products and the daily capacity of the three machines are given in the table below:

Machine	Time Per unit (minutes)			Machine Capacity (mins/day)
	Product 1	Product 2	Product 3	
M1	2	3	2	440
M2	4	-	3	470
M3	2	5	-	430

It is required to determine the daily number of units to be manufactured for each product. The profits per unit of product 1, 2 and 3 is Rs.4, Rs. 3 and Rs.6 respectively. It is assumed that all the amounts produced are consumed in the market. Formulate the LPP model that maximize daily profit using simplex method.

15. Solve the problem from factory to the warehouse using North west corner and find the optimal solution. K6 CO5

	W1	**W2**	**W3**	**W4**	**Supply**
F1	3	1	7	4	250
F2	2	6	5	9	350
F3	8	3	3	2	400
Demand	200	300	350	150	

16. An airline that operates 7 days a week has the time table shown below. Crew must have a minimum layover of 5 hours between flights. Obtain the pairing of flights that minimizes layover time away from home assuming that the crew can be based at either of the two cities. The crew will be based at the city that results in smaller layover. K6 CO5

DELHI - JAIPUR			**JAIPUR - DELHI**		
Flight No.	**Depart**	**Arrive**	**Flight No.**	**Depart**	**Arrive**
1	7:00AM	8:00AM	101	8:00AM	9:15AM
2	8:00AM	9:00AM	102	8:30AM	9:45AM
3	1:30PM	2:30PM	103	12:00 Noon	1:15PM
4	6:30PM	7:30PM	104	5:30PM	6:45PM

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