LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.A. DEGREE EXAMINATION – **ECONOMICS**

FOURTH SEMESTER – **APRIL 2025**

UEC 4602 – OPERATIONS RESEARCH

Date: 08-05-2025 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 PM

	SECTION A - K1 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
1.	**Choose the correct answer**	
a)	Operations research is the application of _____method to arrive at the optimal Solutions to the problems. A. economical B. scientific C. a and b both D. artistic	
b)	When the total supply is not equal to total demand in a transportation problem then it is called a A. Balanced B. Unbalanced C. Degenerate D. None of these	
c)	Which of the following is used to come up with a solution to the assignment problem? A. MODI method B. Northwest corner method C. Stepping-stone method D. Hungarian method	
d)	If the order quantity (size of order) is increased, _____ A. holding costs decrease and ordering costs increase B. holding costs increase and ordering costs decrease C. the total costs increase and then decrease D. storage cost as well as stock-out cost increase	
e)	The objective of network analysis is to _____ A. minimize total project duration B. minimize total project cost C. minimize production delays, interruption, and conflicts D. maximize total project duration	
2.	**State True or False**	
a)	Operations Research started just before World War II in Britain with the establishment of teams of scientists to study the strategic and tactical problems involved in military operations	
b)	Vogels approximation method yields a better initial solution than obtained by the other methods	
c)	Key element is also known as pivot element.	
d)	The slack variables in simplex table indicate excess resource	
e)	In the network, one activity may connect any four nodes	
	SECTION A - K2 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
3.	**Fill in the blanks**	
a)	In graphical representation the bounded region is known as _____ region.	
b)	For finding an optimum solution in transportation problem _____ method is used.	
c)	Hurwicz criterion is also called the _____average Criterion.	
d)	The difference between total float and head event slack is _____	
e)	Inventory control is an important part of _____Management.	
4.	**Answer the following in one or two sentences**	
a)	List out the phases of Transportation model	
b)	Define Decision variable	
c)	State the Expected opportunity loss	
d)	What is meant by total float?	
e)	Mention the various types of inventories	

SECTION B - K3 (CO2)

Answer any TWO of the following in 100 words each. **(2 x 10 = 20)**

5. An advertising company wishes to plan its advertising strategy in three different media -television, radio, and magazines. the purpose of advertising is to reach as large number of potential customers as possible, following data obtained from market survey

	Television	Radio	Magazine I	Magazine II
Costs of advertising unit	₹30,000	₹20000	₹15000	₹10000
No. of potential customers reached per unit	₹2,00,000	₹6,00,000	₹1,50000	₹1,00,000
No. Of female customer reached per unit	₹1,50,000	₹4,00,000	₹70,000	₹50,000

The company wants to spend not more than ₹4,50,000 on Advertising. following are the further requirement that must be met:

I) At least 1 million exposures take place among female customers

II) Advertising on magazines be limited to ₹1,50,000

III) At least 3 Advertising units be bought on magazine I and 2 units on Magazine II

The number of advertising units on television and Radio should each be between 5 to 10. Formulate an LLP.

6. Find the assignment of salesman to various districts which will yield maximum profit.(Maximisation problem)

Salesman	District			
	I	II	III	IV
A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	12	14	15

7. Solve the following LPP using the simplex method

Maximise $Z=12x_1+16x_2$

Subject to $10x_1 +20x_2 \leq 120$

$8x_1+8x_2 \leq 80$

x_1 and $x_2 \geq 0$

8. In a factory, there are six jobs to perform, each of which should go through two machines A and B, in the order A, B. The processing timings (in hours) for the jobs are given here. You are required to determine the sequence for performing the jobs that would minimize the total elapsed time, T. What is the value of T?

Job	J1	J2	J3	J4	J5	J6
Machine A	1	3	8	5	6	3
Machine B	5	6	3	2	2	10

SECTION C – K4 (CO3)

Answer any TWO of the following in 100 words each. **(2 x 10 = 20)**

9. Minimize $Z=3X_1+2X_2$ using graphical method.
Subject to $5X_1+X_2 \geq 10$
$X_1+X_2 \geq 6$
$X_1+4X_2 \geq 12$
$X_1, X_2, \geq 0$

10. Explain the steps involved in simplex method for solving a linear programming problem.

11. A TV dealer finds that the cost of a T V in stock for a week is ₹ 30 and the cost of a unit shortage is ₹ 70. For one particular model of TV the probability distribution of weekly sales is as follows:

Weekly sales	0	1	2	3	4	5	6
Probability	0.10	0.10	0.20	0.25	0.15	0.15	0.05

How many units per week should the dealer order?

12. For the following data, draw a network diagram. Find the critical path, slack time after calculating the earliest expected time and the latest allowable time

Activity	Duration	Activity	Duration
(1 – 2)	5	(5 – 9)	3
(1 – 3)	8	(6 – 10)	5
(2 – 4)	6	(7 – 10)	4
(2 – 5)	4	(8 – 11)	9
(2 – 6)	4	(9 – 12)	2
(3– 7)	5	(10 – 12)	4
(3 – 8)	3	(11 – 13)	1
(4 – 9)	1	(12 – 13)	7

SECTION D – K5 (CO4)

Answer any ONE of the following in 250 words **(1 x 20 = 20)**

13. A Machine operator must perform three operations: turning, threading, and knurling on a number of different jobs. The Time required to perform these operations (in minutes) for each job is known. Determine the order in which the jobs should be processed to minimise the total time required to turn out all the jobs. Also find the idle times for the three operations.

Jobs	Time for turning (Minutes)	Time for threading (Minutes)	Time for knurling (Minutes)
1	3	8	13
2	12	6	14
3	5	4	9
4	2	6	12
5	9	3	8
6	11	1	13

14. Find the optimal solution for the following problem using NWCR and UV method.

	Destination					
	D1	D2	D3	D4	D5	Supply
source	I	3	1	7	4	250
	II	2	6	5	9	350
	II	8	3	3	2	400
	Demand	200	300	350	150	1000

SECTION E – K6 (CO5)

Answer any ONE of the following in 250 words **(1 x 20 = 20)**

15. A computer Centre has four expert programmers and needs to develop four application programmes. The head of the computer Centre, estimates the computer time (in minutes) required by the respective experts to develop the application programme as follows:

	Programmes				
		A	B	C	D
Programmers	1	120	100	80	90
	2	80	90	110	70
	3	110	140	120	100
	4	90	90	80	90

Find the assignment pattern that minimizes the time required to develop the application programme.

16. (a) Calculate the E.O.Q. in units and total variable cost for the following items, assuming an ordering cost of ₹.5 and a holding cost of 10%.

Item	Unit Price in ₹	Annual demand
A	0.02	800 units
B	1.00	400 units
C	8.00	392 units
D	0.20	13,800 units

(b) For the above problem, compute E.O. Q in rupees as well as in years of supply. Also calculate the E.O.Q. frequency for each of the four items.
