



MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)



Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

DEPARTMENT OF MANAGEMENT STUDIES

QUESTION BANK

19MBB05- Quantitative Methods and Techniques

UNIT-I

Part- A 2 Marks

1. Define Operations Research.
2. Brief the scope of OR?
3. What are the situations where OR will be applicable?
4. What is linear programming?
5. What are the components of LP?
6. What are the applications of LP problem?
7. What is Objective function?
8. What is a constraint?
9. What is Decision Variable?
10. What are the assumptions in LP?

Part – B 13 Marks

1. Solve the linear programming problem using graphical method.

$$\text{Maximize } Z=3X_1+2X_2$$

Subject to constraints,

$$-2 X_1+ X_2 \leq 1$$

$$X_1 \leq 2$$

$$X_1+ X_2 \leq 3$$

Where $X_1, X_2 \geq 0$

2. Solve the L.P.P. by Big M method.

$$\text{Maximize } Z=5 X_1-2X_2+3X_3$$

Subject to constraints,

$$2 X_1+ 2X_2- X_3 \geq 2$$

$$3 X_1-4X_2 \leq 3$$

$$X_2+3X_3 \leq 5$$

Where $X_1, X_2, X_3 \geq 0$

3. Solve the L.P.P. by simplex method.

$$\text{Maximize } Z=5X_1+3X_2$$

Subject to constraints,

$$X_1+ X_2 \leq 2$$

$$5X_1+ 2X_2 \leq 10$$

$$3X_1 + 8X_2 \leq 12$$

Where $X_1, X_2 \geq 0$

4. Solve the following LPP by Graphically.

Maximize $Z = 6x + 3y$

Subject to

$$3x + 4y \leq 2400$$

$$2x + y \leq 1000$$

$$y \leq 450$$

$$x \geq 100$$

$$\text{and } x, y \geq 0$$

5. i) Write the areas of application where quantitative techniques can be applied.
ii) Define O.R. and discuss its characteristics.

UNIT-II

2 Marks

1. What is degeneracy in a transportation model?
2. Differentiate between balanced and unbalanced cases in assignment models.
3. What is balanced transportation problem?
4. What is transshipment problem?
5. Distinguish between transportation problem and transshipment problem.
6. Compare transportation problem and assignment problem.
7. What is transportation problem?
8. What are the methods to solve transportation problem?
9. What are the types of transportation problem?
10. What are the techniques to find initial basic feasible solution?

PART-B

1. Using Vogel's method, find a feasible solution to the following transportation problem and test for its optimality:

	W_1	W_2	W_3	Supply
P_1	10	12	8	500
P_2	15	10	12	300
P_3	8	6	10	200
Demand	300	400	300	

2. Consider a transportation problem with $m=3$ and $n=4$ where:

$C_{11}=2,$	$C_{12}=3$	$C_{13}=11$	$C_{14}=7$
$C_{21}=1$	$C_{22}=0$	$C_{23}=6$	$C_{24}=1$
$C_{31}=5$	$C_{32}=8$	$C_{33}=15$	$C_{34}=9$

Suppose $S_1=6, S_2=1$ and $S_3=10$ whereas $D_1=7, D_2=5$ and $D_3=3$ and $D_4=2$. Apply the transportation simplex method to find out an optimal solution.

3. XYZ Tobacco company purchases tobacco and stores in warehouses located in the following four cities:

Warehouse location	Capacity (tones)
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City A	90
City B	50
City C	80
City D	60

The warehouse supply tobacco to cigarette companies in three cities that have the following demand.

Cigarette Company	Demand (tones)
Bharat	120
Janta	100
Red lamp	110

The adjoining railroad shipping cost per tonne (in 100 RS) has been determined:

From	To		
	Bharat	Janta	Red lamp
A	7	10	5
B	12	9	4
C	7	3	11
D	9	5	7

Because of railroad construction shipments are temporarily prohibited from warehouse at city A to Bharat Cigarette Company

- Find the optimum distribution for XYZ Tobacco Company.
- Are there multiple optimum solutions? If there are alternative optimum solutions, identify them.

4. Solve the following assignment problem

		Men				
		1	2	3	4	5
Job	A	18	14	x	13	17
	B	15	17	13	18	20
	C	22	23	20	21	19
	D	18	x	15	18	14
	E	22	21	20	19	21

5. The owner of a small machine shop has four machinists available to assign to jobs for the day. Five jobs are offered with expected profit for each machinist on each job as follows:

		A	B	C	D	E
	1	62	78	5	101	82
	2	71	84	61	73	59
	3	87	92	111	71	81
	4	48	64	87	77	80

Find the assignment of machinists to jobs that will result in a maximum profit. Which job should be declined?

UNIT – III

2 Marks

1. Distinguish between pure and mixed integer programming problem.
2. What is the properties of the cut generated by cutting plane algorithm?
3. When two-person zero sum game has a saddle point?
4. What are the major algorithms to solve integer programming problem?
5. What are the limitations of game theory?
6. What is game theory?
7. What is inventory?
8. What are the costs associated with inventory system?
9. What is EOQ?
10. What are the models of inventory?

13 Marks

1. Players A and B play a game in which each player has three coins (20p, 25p and 50p). Each of them selects a coin without the knowledge of the other person. If the sum of the values of the coins is an even number, A wins B's coin. If that sum is an odd number, B wins A's coin.
 - a. Develop a payoff matrix with respect to Player A
 - b. Find the optimal strategies for the players.
2. Solve the following 3x5 game using dominance property.

		Player B				
		1	2	3	4	5
Player A	1	2	5	10	7	2
	2	3	3	6	6	4
	3	4	4	8	12	1

3. Consider the payoff matrix of Player A as shown in table and solve it optimally using the graphical method.

		Player B				
		1	2	3	4	5
Player A	1	3	6	8	4	4
	2	-7	4	2	10	2

4. Alpha Industry needs 15,000 units per year of a bought-out component which will be used in its main product. The ordering cost is Rs.125 per order and the carrying cost per unit per year is 20% of the purchase price per unit. The purchase price per unit is Rs.75. Find economic order quantity, number of orders per year and time between successive orders.

5. An automobile factory manufactures a particular type of gear within the factory. This gear is used in the final assembly. The particulars of this gear are: demand rate $r = 14,000$ units/ year, production rate $k = 35,000$ units/year, set up cost $C_0 = \text{Rs.}500$ per set up and carrying cost, $C_c = \text{Rs.}15$ unit/year.

UNIT – IV

PART-A

1. Define decision trees.
2. What is meant by quantity discount models?
3. Define CPM?
4. What is PERT?
5. Distinguish between CPM and PERT?
6. Discuss the guidelines for constructing a project network
7. Define the following a) total float b) free float c) critical path
8. What are the time estimates used in PERT?
9. Discuss the cost trade-off in project crashing?
10. Distinguish between resource leveling and resource allocation?

13 Marks

1. Consider the details of a project as shown in the table.

Activity	Immediate Predecessors(s)	Duration (months)
A	-	4
B	-	8
C	-	5
D	A	4
E	A	5
F	B	7
G	B	4
H	C	8
I	C	3
J	D	6
K	E	5
L	F	4
M	G	12
N	H	7
O	I	10
P	J,K,L	5
Q	M,N,O	8

- a. Construct the CPM network
 - b. Determine the critical path
 - c. Compute total floats and free floats for non critical activities
2. A project consists of seven activities for which relevant data are given below: (i) Draw the network (5 Marks) (ii) Name and highlight the critical path.

Activity	Preceding activity	duration (days)
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A		4
B		7
C		6
D	A,B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

3. Consider the details of a project as shown in the table.

Activity	Immediate Predecessors(s)	Duration (months)
A	-	10
B	-	7
C	A	5
D	C	3
E	D	2
F	B,E	1
G	F	14

4. Consider the following data of a project.

Activity	Predecessor(s)	Duration (Weeks)		
		a	m	b
A	-	3	5	8
B	-	6	7	9
C	A	4	5	9
D	B	3	5	8
E	A	4	6	9
F	C,D	5	8	11
G	C,D,E	3	6	9
H	F	1	2	9

- Construct the project network.
- Find the expected duration and variance of each activity
- Find the critical path and the expected project completion time.
- What is the probability of completing the project on or before 30 weeks?

5. Given is the following information regarding a project:

Activity	A	B	C	D	E	F	G	H	I	J	K
L											
Dependence	-	-	-	AB	B	B	FC	B	EH	EH	CDFJ
K											
Duration (days)	3	4	2	5	1	3	6	4	4	2	1

5
Draw the Network Diagram and identify the Critical Path and Project Duration.

UNIT-V

2 Marks

1. Define group replacement.
2. Distinguish between jockeying and balking
3. Define economic life of an asset.
4. What are the basic reasons for replacement?
5. What are the behaviours of customer in a queuing model?
6. Give different types of replacement policies.
7. What is average queue length?
8. What is meant by multi-channel models in queuing theory?
9. Discuss the application areas of queuing theory.
10. List down the terminologies used in queuing systems.

13 Marks

1. A truck owner finds his past records that the maintenance cost of a truck (whose purchase price is Rs. 3,00,000) during the first eight years of its life and the resale prices at the end of each year, are as follows:

Year	Maintenance cost (Rs.)	Resale price (Rs.)
1		36,000
	2,00,000	
2		48,000
	1,50,000	
3		60,000
	1,00,000	
4		72,000
	80,000	
5		84,000
	70,000	
6		96,000
	60,000	
7		1,08,000
	50,000	
8		1,20,000
	40,000	

Suggest optimal policy for the replacement of the truck.

2. An electronic company has a highly specialized precision machine with also a high rate of obsolescence. In spite of regular maintenance, the quality of the output of the machine deteriorates fast and adversely affects the percent acceptable components and the

revenue. It is required to determine the time when machines of this type would be due for replacement. The following data are available from past records:

Year	:	1	2	3	4	5
Yearly gross earnings from sales (Rs.):		20,000	15,000	5,000	4,000	3,500
Yearly expenses (Rs.)	:	1,500	2,000	2,500	3,000	3,000
Salvage value at the end of the year (Rs.):		10,000	6,000	3,000	1,000	---

If the installed cost of the machine is Rs. 25,000 and the expected rate of return for company investments is 10%, find the economic life of the machine.

- A truck has been purchased at a cost of Rs. 1, 60,000. The value of truck is depreciated in the first three years by Rs. 20,000 each year and Rs. 16000 per year thereafter. Its maintenance and operating costs for the first three years are Rs. 16000, Rs. 18000 and Rs. 20000 in that order and increase by Rs.4,000 every year. Assuming an interest rate of 10%, find the economic life of the truck.
- Explain the graphical method to solve two jobs on M machine with given technological ordering for each job. What are the limitations of the method?
- We have seven jobs each of which has to go through the machine M1 and M2 in the other order M1, M2 processing time in hrs are given below

Job	1	2	3	4	5	6	7
Machine 1	3	12	15	6	10	11	9
Machine 2	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time.