

2+3+5=10

5. a. What do you mean by Assignment Problem?
 b. Draw a flow chart in Hungarian Assignment Method (Minimization case).
 c. Four jobs are to be done on four different machines. The cost (in rupees) of producing i th job on the j th machine is given below:

		Machines			
		M ₁	M ₂	M ₃	M ₄
Jobs	J ₁	85	50	30	40
	J ₂	90	40	70	45
	J ₃	70	60	60	50
	J ₄	75	45	35	55

Assign the jobs to different machines so as to minimize the total cost.

6. a. Define basic feasible solution and optimal solution in terms of transportation problem.
 b. Write the mathematical formulation of transportation problem.
 c. State the basic assumptions of transportation problem.
7. a. What is an unbalanced transportation problem? How such a problem handled and solution is obtained?
 b. Compute initial basic feasible solution by North-West-Corner Method.

3+3+4=10

5+5=10

Plants	Sales Outlet			Capacity
	A	B	C	
P	3	8	9	35
Q	4	4	6	40
R	8	3	5	55
Requirement	40	50	30	125 120

8. a. Describe 5 important features of queuing model.
 b. Explain different types of queue discipline.

5+5=10

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**MA ECONOMICS
 FOURTH SEMESTER
 OPERATION RESEARCH
 MEC-403**

(Use separate answer scripts for Objective & Descriptive)

Duration : 3 hrs.

Full Marks : 70

(PART-A : Objective)

Time : 20 min.

Marks : 20

Choose the correct answer from the following:

1x20=20

- The approach of Operations Research comprises the following consequential steps:
 - orientation
 - model formulations
 - analysis and interpretation of results
 - all of the above
- For analyzing a problem, decision-makers should normally study:
 - its qualitative aspects
 - its quantitative
 - both (a) and (b)
 - neither (a) nor (b)
- Managerial decisions are based on:
 - an evaluation of quantitative data
 - the use of quantitative
 - numbers produced by formal model
 - all of the above
- A constraint in an LP model restricts:
 - value of objective function
 - value of decision variable
 - use of the available resource
 - all of the above
- Constraints in an LP model represents:
 - limitations
 - requirements
 - balancing limitations and requirements
 - all of the above
- The graphical method of LP problem uses:
 - objective function equation
 - constraint equations
 - linear equations
 - all of the above
- If two constraints do not intersect in the positive quadrant of the graph, then:
 - the problem is infeasible
 - the solution is unbounded
 - one of the constraint is redundant
 - none of the above
- For maximization LP model, the simplex is terminated when all values:
 - $c_j - z_j \leq 0$
 - $c_j - z_j \geq 0$
 - $c_j - z_j = 0$
 - $z_j \leq 0$
- For a maximization problem the objective function coefficient for a slack variable is:
 - + 1
 - 1
 - 0
 - None of the above
- An optimal assignment requires that the maximum number of lines that can be drawn through squares with zero opportunity cost be equal to the number of:
 - rows or columns
 - rows and columns
 - rows + columns - 1
 - none of the above

11. The purpose of dummy row or column in an assignment problem is to:
 - a. obtain balance between total activities and total resources.
 - b. prevent a solution from becoming degenerate.
 - c. provides a means of representing a dummy problem.
 - d. none of the above.
12. If there were n workers and n jobs there would be:
 - a. n! solutions
 - b. (n- 1)! solutions
 - c. (n!)n solutions
 - d. n solutions
13. When total supply is equal to the total demand in a transportation problem , the problem is said to be.....
 - a. unbalanced problem
 - b. balanced problem
 - c. maximization problem
 - d. none of these
14. Two person zero-sum game means that the sum of..... to one player is equal to the sum of theto other player.
 - a. gain, loss
 - b. alternatives, courses of action
 - c. income, expenditure
 - d. none of these
15. A game whose decision value is zero is termed as..... game.
 - a. competitive
 - b. fair
 - c. both a and b
 - d. none of these
16. The..... in a pay off matrix is one which is the smallest value in its raw and the largest value in its column.
 - a. saddle point
 - b. pure strategies
 - c. odds
 - d. none of these
17. Leaving variable is selected with key row having positive..... ratio in simplex method.
 - a. maximum
 - b. minimum
 - c. both a) and b)
 - d. none of these
18. Assignment problem deals in allocating the various resources or items to various activities on..... basis in such a way that the time or cost involved is minimized and sale or profit is maximized.
 - a. one to one
 - b. one to many
 - c. many to one
 - d. none of these
19. The queuing theory is based on one of the following assumptions:
 - a. infinite size
 - b. random variable
 - c. distribution
 - d. all of the above
20. The average time that a customer has to wait to get service is known as in queuing theory.
 - a. total time
 - b. waiting time
 - c. idle time
 - d. all of the above

(PART-B : Descriptive)

Time : 2 hrs. 40 min.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. a. What is game theory? 3+2+5=10
- b. Describe the essential feature of game theory.
- c. Solve the following game using Dominance Method.

		Player B		
		B ₁	B ₂	B ₃
Player A	A ₁	2	8	3
	A ₂	6	2	8
	A ₃	4	1	6

2. What are the different approaches of OR Methodology? Explain the approaches with the help of diagram. 5+5=10
3. a. Explain the following terms in context of LPP: 4+6=10
 - i. Optimal Solution.
 - ii. Basic Feasible Solution.
- b. Solve the following LPP by graphical method or simplex method.

Max $Z = 300X + 400Y$

Sub to $5X + 4Y \leq 200$

$3X + 5Y \leq 150$

$5X + 4Y \geq 100$

$8X + 4Y \geq 80$

Where $X, Y, \geq 0$
4. a. Explain the term objective function & additivity in relation to LP problem. 5+5=10
- b. Vitamins A and B are available in two different foods P & Q. One unit of P contains 2 units of vitamin A & 3 units of vitamin B. One unit of Q contains 5 units of vitamin A & 4 units of vitamin B. The minimum daily consumption of vitamin A and B should be 1200 and 1000 respectively. One unit of P costs Rs. 7 and one unit of Q costs Rs. 5. Formulate the problem as a linear programming problem.