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REDUCED Operations Research

12th Standard

Business Maths

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28 x 1 = 28

1) The transportation problem is said to be unbalanced if _____
   (a) Total supply ≠ Total demand (b) Total supply = Total demand (c) m = n (d) m+n–1
2) In a non – degenerate solution number of allocations is
   (a) Equal to m+n–1 (b) Equal to m+n+1 (c) Not equal to m+n–1 (d) Not equal to m+n+1
3) In a degenerate solution number of allocations is
   (a) equal to m+n–1 (b) not equal to m+n–1 (c) less than m+n–1 (d) greather than m+n–1
4) The Penalty in VAM represents difference between the first _____
   (a) Two largest costs (b) Largest and Smallest costs (c) Smallest two costs (d) None of these
5) Number of basic allocation in any row or column in an assignment problem can be
   (a) Exactly one (b) at least one (c) at most one (d) none of these
6) North-West Corner refers to _____
   (a) top left corner (b) top right corner (c) bottom right corner (d) bottom left corner
7) Solution for transportation problem using _____method is nearer to an optimal solution.
   (a) NWCM (b) LCM (c) VAM (d) Row Minima
8) If number of sources is not equal to number of destinations, the assignment problem is called_____
   (a) balanced (b) unsymmetric (c) symmetric (d) unbalanced
9) The purpose of a dummy row or column in an assignment problem is to
   (a) prevent a solution from becoming degenerate (b) balance between total activities and total resources (c) provide a means of representing a dummy problem (d) none of the above
10) The solution for an assignment problem is optimal if
   (a) each row and each column has no assignment (b) each row and each column has atleast one assignment (c) each row and each column has atmost one assignment (d) each row and each column has exactly one assignment
11) In an assignment problem involving four workers and three jobs, total number of assignments possible are
   (a) 4 (b) 3 (c) 7 (d) 12
12) Decision theory is concerned with
   (a) analysis of (b) decision (c) selecting optimal (d) All of

information that is available | making under certainty | decisions in sequential problem | the above

13) A type of decision –making environment is
(a) certainty (b) uncertainty (c) risk (d) all of the above

14) A set of non-negative values that satisfies the constants in a transportation problem is a
(a) Basic feasible solution | (b) Feasible solution | (c) Optimal solution | (d) Non degenerate basic feasible solution

15)

	A	B	C
1	(5) 2	7	4
2	(2) 3	(6) 3	1
3	5	4	(3) 7

The total transportation cost is
(a) 55 (b) 102 (c) 101 (d) 50

16) In least cost method if the minimum cost is not unique then the choice can be made as
(a) arbitrarily (b) unique (c) difference (d) summation

17) Vogel's approximation method yields an initial basic feasible solution which is very close to the solution.
(a) maximum (b) minimum (c) optimum (d) unique

18) To assign different jobs to the different machines to minimize the overall cost is
(a) transportation problem | (b) assignment problem | (c) minimax principle | (d) maximin principle

19) The optimum_____schedule remains, unaltered if we add or subtract a constant from all the elements of the row or which of the cost_____matrix.
(a) transportation (b) assignment (c) unique (d) optimal

20) If the number of rows is____tothenumber of columns, then the assignment problem is said to be balanced.
(a) equal (b) less (c) more (d) not equal

21) _____ method provides optimum assignment schedule in an assignment problem.
(a) North West Corner | (b) Least cost | (c) Vogel's Approximation Method | (d) Hungarian Method

22) _____determines the lowest out comes for each alternative.
(a) Least cost (b) Minimax criteria (c) Maximin criteria (d) Payoff matrix

23) _____determines the highest out come for each alternative.
(a) Maximum cost (b) Minimax criteria (c) Maximin criteria (d) Payoff

24) Operation research is an analytical method of
(a) problem solving | (b) decision making | (c) optimal cost of transportation | (d) unit cost of transportation

25) The methods of funding feasible solution to a transportation problem
(a) North West Corner Rule | (b) Least Cost Method | (c) Hungarian Method | (d) Vogel's Approximation Method

26) The given data is a balanced transportation problem

	A	B	C	Supply
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14

Then total demand

(a) 7 + 9 + 18 (b) 9 + 7 + 10 + 8 (c) 15+ 15 + 4 (d) 10+ 10+ 14

27) The least cost method is more economical than North West Corner Rule, since it starts with the

(a) least cost (b) minimum cost (c) maximum cost (d) lower beginning cost

28) The penalty is the difference between the ___ costs in each row and column.

(a) smallest (b) biggest (c) minimum (d) least

9 x 2 = 18

29) What is transportation problem?

30) Write mathematical form of transportation problem.

31) what is feasible solution and non degenerate solution in transportation problem?

32) What do you mean by balanced transportation problem?

33) Obtain the initial solution for the following problem using north-west comer rule.

	A	B	C	D	Supply
1	3	1	7	4	10
2	2	6	5	9	5
3	8	3	3	2	3
Demand	5	4	6	3	

34) Determine an initial basic feasible solution to the following transportation problem using feast cost method.

	D_1	D_2	D_3	Availability
O_1	4	8	8	150
O_2	12	8	11	100
O_3	10	6	9	250
Requirement	50	150	300	

35) Consider the following pay-off (profit) matrix action, states

Action	States	
	B_1	B_2
A_1	8	6
A_2	9	2
A_3	6	4

Determine the best action using maximin principle.

36) For the given pay-off matrix, find the optimal decision under the minimax principle.

37) The following is the pay-off matrix (in rupees) for three strategies and three states of nature. Select a strategy using maximin principle.

23 x 3 = 69

38) Obtain the initial solution for the following problem

		Destination			
		A	B	C	Supply
Sources	1	2	7	4	5
	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
Demand		7	9	18	

39) Determine an initial basic feasible solution to the following transportation problem using North West corner rule.

	D_1	D_2	D_3	D_4	Availability
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Requirement	6	10	15	4	35

Here O_i and D_j represent ith origin and jth destination.

40) Obtain an initial basic feasible solution to the following transportation problem using least cost method.

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	3	4	6
O_2	4	3	2	5	8
O_3	5	2	2	1	10
Demand	4	6	8	6	

Here O_i and D_j denote i^{th} origin and j^{th} destination respectively.

41) Determine how much quantity should be stepped from factory to various destinations for the following transportation problem using the least cost method

		Destination				
		C	*H*	*K*	*P*	Capacity
Factory	*T*	6	8	8	5	30
	B	5	11	9	7	40
	M	8	9	7	13	50
	Demand	35	28	32	25	

Cost are expressed in terms of rupees per unit shipped.

42) Consider the following pay-off (profit) matrix Action States

Action	States			
	(s_1)	(s_2)	(s_3)	(s_4)
A_1	5	10	18	25
A_2	8	7	8	23
A_3	21	18	12	21
A_4	30	22	19	15

Determine best action using maximin principle.

43) A business man has three alternatives open to him each of which can be followed by any of the four possible events. The conditional pay offs for each action - event combination are given below:

Alternative	Pay – offs (Conditional events)

	A	B	C	D
X	8	0	-10	6
Y	-4	12	18	-2
A_3	14	6	0	8

Determine which alternative should the businessman choose, if he adopts the maximin principle.

44) Consider the following pay-off matrix

Alternative	Pay – offs (Conditional events)			
	A_1	A_2	A_3	A_4
E_1	7	12	20	27
E_2	10	9	10	25
E_3	23	20	14	23
E_4	32	24	21	17

Using minmax principle, determine the best alternative.

45) Find an initial basic feasible solution of the following problem using north west corner rule.

	D_1	D_2	D_3	D_4	Supply
O_1	5	3	6	2	19
O_2	4	7	9	1	37
O_3	3	4	7	5	34
Demand	16	18	31	25	

46) Determine an initial basic feasible solution of the following transportation problem by north west corner method

	Bangalore	Nasik	Bhopal	Delhi	Capacity
Chennai	6	8	8	5	30
Madurai	5	11	9	7	40
Trichy	8	9	7	13	50
Demand (Units/day	35	28	32	25	

47) Obtain an initial basic feasible solution to the following transportation problem by using least- cost method.

	D_1	D_2	D_3	Supply
O_1	9	8	5	25
O_2	6	8	4	35
O_3	7	6	9	40
demand	30	25	45	

48) Determine basic feasible solution to the following transportation problem using North west Corner rule.

		Sinks					Supply
		A	B	C	D	E	
Origins	P	2	11	10	3	7	4
	Q	1	4	7	2	1	8
	R	3	9	4	8	12	9
Demand		3	3	4	5	6	

49) Find the initial basic feasible solution of the following transportation problem:

	I	II	III	Demand
A	1	2	6	7
B	0	4	2	12
C	3	1	5	11
Supply	10	10	10	

Using (i) North West Corner rule
(ii) Least Cost method
(iii) Vogel's approximation method

50) Given the following pay-off matrix(in rupees) for three strategies and two states of nature.

Strategy	States-of-nature	
	E_1	E_2
S_1	40	60
S_2	10	-20
S_3	-40	150

Select a strategy using each of the following rule (i) Maximin (ii) Minimax

51) A farmer wants to decide which of the three crops he should plant on his 100-acre farm. The profit from each is dependent on the rainfall during the growing season. The farmer has categorized the amount of rainfall as high medium and low. His estimated profit for each is shown in the table.

Rainfall	Estimated Conditional Profit(Rs.)		
	crop A	crop B	crop C
High	8000	3500	5000
Medium	4500	4500	5000
Low	2000	5000	4000

If the farmer wishes to plant only crop, decide which should be his best crop using
(i) Maximin (ii)Minimax

52) The research department of Hindustan Ltd. has recommended to pay marketing department to launch a shampoo of three different types. The marketing types of shampoo to be launched under the following estimated pay-offs for various level of sales.

Types of shampoo	Estimated Sales (in Units)		
	15000	10000	5000
Egg shampoo	30	10	10
Clinic Shampoo	40	15	5
Deluxe Shampoo	55	20	3

What will be the marketing manager's decision if
(i) Maximin and
(ii) Minimax principle applied?

53) Following pay-off matrix, which is the optimal decision under each of the following rule
(i) maxmin
(ii) minimax

Act	States of nature			
	S_1	S_2	S_3	S_4

A_1	14	9	10	5
A_2	11	10	8	7
A_3	9	10	10	11
A_4	8	10	11	13

54) The following table summarizes the supply, demand and cost information for four factors S_1, S_2, S_3, S_4. shipping goods to three warehouses D_1, D_2, D_3.

	D_1	D_2	D_3	Supply
S_1	2	7	14	5
S_2	3	3	1	8
S_3	5	4	7	7
S_4	1	6	2	14
Demand	7	9	18	

Find an initial solution by using north west corner rule. What is the total cost for this solution?

Find an initial solution by using north west corner rule. What is the total cost for this solution?

55) A person wants to invest in one of three alternative investment plans: Stock, Bonds and Debentures. It is assumed that the person wishes to invest all of the funds in a plan. The pay-off matrix based on three potential economic conditions is given in the following table:

Alternative	Economic conditions		
	High growth(Rs.)	Normal growth(Rs.)	Slow growth (Rs.)s
Stocks	10000	7000	3000
Bonds	8000	6000	1000
Debentures	6000	6000	6000

Determine the best investment plan using each of following criteria i) Maxmin ii) Minimax.

56) For the given pay-off matrix, choose the best alternative for the given states of nature under

(i) Maximin (ii) Minimax princple

Alternative	States of Nature		
	Good	Fair	Bad
A	100	60	+50
B	80	50	+10
C	40	20	+5

57) Determine an initial basic feasible solution to the following transportation problem using North West corner rule.

	P	Q	R	S	Supply
A	3	1	7	4	300
B	2	6	5	9	400
C	8	3	3	2	500
Demand	250	350	400	200	

58) Determine how much quantity should be stepped from factory to various destinations for the following transportation problem using the least cost method.

	Destination				
	A	B	C	D	Capacity
Factory O_1	19	30	50	10	7
O_2	20	30	40	60	9
O_3	40	8	70	20	18
Demand	5	8	7	14	

59) Find the initial basic feasible solution for the following transportation problem by Vogel's approximation method.

	A	B	C	Supply (a_i)
S_1	5	1	8	12
S_2	2	4	0	14
S_3	3	6	7	4
Demand(b_j)	9	10	11	

60) Solve the following assignment problem. Cell values represent cost of assigning job A, B, C and D to the operators I, II, III and IV.

	Operators			
	I	II	III	IV
Job A	5	3	2	8
B	7	9	2	6
C	6	4	5	7
D	5	7	7	8

7 x 5 = 35

61) Find the initial basic feasible solution for the following transportation problem by VAM

		Distribution Centers				Availability
		D_1	D_2	D_3	D_4	---
origin	S_1	11	13	17	14	250
	S_2	16	18	14	10	300
	S_3	21	24	13	10	400
	Requirement	200	225	275	250	

62) Obtain an initial basic feasible solution to the following transportation problem using Vogel's approximation method.

Ware houses	Stores				
	I	II	III	IV	Availability (a_i)
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	1	4	5	19
Requirement (b_j)	21	25	17	17	

63) Obtain an initial basic feasible solution to the following transportation problem by north west corner method.

	D	E	F	C	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Required	200	225	275	250	

64) A computer centre has got three expert programmers. The centre needs three application programmes to be developed. The head of the computer centre, after studying carefully the programmes to be developed, estimates the computer time in minitues required by the experts to the application programme as follows.

		Programmes		
		P	Q	R
Programmers	1	120	100	80
	2	80	90	110
	3	110	140	120

Assign the programmers to the programme in such a way that the total computer time is least.

65) Consider the following transportation problem

	Destination				Availability
	D_1	D_2	D_3	D_4	
O_1	5	8	3	6	30
O_2	4	5	7	4	50
O_3	6	2	4	6	20
Requirement	30	40	20	10	

Determine an initial basic feasible solution using (a) Least cost method (b) Vogel's approximation method.

66) Determine an initial basic feasible solution to the following transportation problem by using North West Corner rule

		Destination			Supply
		D_1	D_2	D_3	
Source	S_1	9	8	5	25
	S_2	6	8	4	35
	S_3	7	6	9	40
Requirement		30	25	45	

67) Explain NWC by obtaining initial basic feasible solution of the following transportation problem.

		Destination				Supply
		D_1	D_2	D_3	D_4	
Origin	O_1	2	3	11	7	6
	O_2	1	0	6	1	1
	O_3	5	8	15	9	10
Demand		7	5	3	2	

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