TM

OPERATIONS RESEARCH

Multiple Choice Questions (MCQs)

1) The purpose of the transportation approach for locational analysis is to minimize
a) total costs
b) total shipping costs
c) total variable costs
d) total fixed costs
e) the number of shipments
Answer : B) Total Shipping Costs

2) Which of the following statements about the northwest corner rule is false?
a) One must exhaust the supply for each row before moving down to the next row
b) One must exhaust the demand requirements of each column before moving to the next column
c) When moving to a new row or column, one must select the cell with the lowest cost
d) One must check that all supply and demand constraints are met
e) All of the above are false
Answer : C) When moving to a new or column, one must select the cell with the lowest cost

3) In transportation model analysis the stepping-stone method is used to
a) obtain an initial optimum solution
b) obtain an initial feasible solution
c) evaluate empty cells for potential solution improvements
d) evaluate empty cells for possible degeneracy
e) balance supply and demand
Answer : C) evaluate empty cells for potential solution improvements

4) A transportation problem has a feasible solution when
a) all of the improvement indexes are positive
b) the number of filled cells is one less than the number of rows plus the number of columns
c) the solution yields the lowest possible cost
d) all demand and supply constraints are satisfied
Answer : All demand and supply constraints are satisfied

5) When the number of shipments in a feasible solution is less than the number of rows plus the number of columns minus one
a) the solution is optimal
b) there is degeneracy, and an artificial allocation must be created
c) a dummy source must be created
d) a dummy destination must be created
e) the closed path has a triangular shape
Answer :there is degeneracy, and artificial allocation must be created

6) The total cost of the optimal solution to a transportation problem
a) is calculated by multiplying the total supply (including any dummy values) by the average cost of the cells
b) cannot be calculated from the information given
c) can be calculated from the original non-optimal cost, by adding the savings made at each improvement
d) is found by multiplying the amounts in each cell by the cost for that cell for each row and then subtract

the products of the amounts in each cell times the cost of each cell for the columns
e) can be calculated based only on the entries in the filled cells of the solution
Answer : e. can be calculated based only on the entries in the filled cells of the solution

7) The stepping-stone method
a) is an alternative to using the northwest corner rule
b) often involves tracing closed paths with a triangular shape
c) is used to evaluate the cost effectiveness of shipping goods via transportation routes not currently in the solution
d) is used to identify the relevant costs in a transportation problem
e) helps determine whether a solution is feasible or not
Answer : is used to evaluate the cost effectiveness of shipping goods via transportation routes not currently in the solution

8) In a minimization problem, a negative improvement index in a cell indicates that the
a) solution is optimal
b) total cost will increase if units are reallocated to that cell
c) total cost will decrease if units are reallocated to that cell
d) current iteration is worse than the previous one
e) problem has no feasible solution
Answer : total cost will decrease if units reallocated to that cell

9) In a minimization problem, a positive improvement index in a cell indicates that
a) the solution is optimal
b) the total cost will increase if units are reallocated to that cell
c) the total cost will decrease if units are reallocated to that cell
d) there is degeneracy
e) the problem has no feasible solution
Answer : the total cost will increase if units are reallocated to that cell

10) Which of the following would not generally be a motive for a firm to hold inventories? To
a) take advantage of quantity discounts
b) minimize holding costs
c)reduce stockout risks
d) decouple production from distribution
e) meet anticipated demand
Answer : minimize holdings cost

11) Operations Research Models in which values of all variables and all possible outcomes are known with certainty are called_____models.
   - **(a)** Physical
   - **(b)** Symbolic
   - **(c)** Deterministic
   - **(d)** Probabilistic

12) Operations Research Models in which some or all variables are random in nature are called _____models.
   - **(e)** Physical
   - **(f)** Symbolic
   - **(g)** Deterministic
   - **(h)** Probabilistic

13) Mean, median and mode are measures of__.
   - **(i)** Central tendency
   - **(j)** Dispersion
   - **(k)** Probability

14) _____and_____are techniques applied in project management.

(l) CPM and PERT
(m) Assignment and Transportation
(n) Decision theory and Inventory models

15) Operations Research techniques are___in nature.
(o) Qualitative
(p) Judgemental
(q) Approximate
(r) Quantitative

[Ans.: (1 – Deterministic); (2 – Probabilistic); (3 – Central tendency); (4 – CPM, PERT); (5 – Quantitative)]

16) _____ are the entities whose values are to be determined from the solution of the LPP.
(a) Objective function
(b) Decision Variables
(c) Constraints
(d) Opportunity costs

17) _____specifies the objective or goal of solving the LPP.
(e) Objective function
(f) Decision Variables
(g) Constraints
(h) Opportunity costs

18) Objective function is expressed in terms of the_.
(i) Numbers
(j) Symbols
(k) Decision Variables

19) _____are the restrictions or limitations imposed on the LPP.
(l) Variables
(m) Costs
(n) Profits
(o) Constraints

20) The type of constraint which specifies maximum capacity of a resource is '____or equal to' constraint.
(p) Less than
(q) Greater than
(r) Less than or greater than

21) In linear programming____represents mathematical equation of the limitations imposed by the problem. ***(April 19)***
(s) Objective function
(t) Decision variable
(u) Redundancy
(v) Constraints

[Ans.: (1 – Decision variables); (2 – Objective function); (3 – decision variables); (4 – Constraints); (5 – less than); (6 – Constraints)]

22) Which of the following are strongly associated with "crossdocking"?
a) non-value-adding activities such as receiving and storing
b) multi-modal transportation facilities at seaports
c) processing items as soon as they are received into a distribution center
d) use of manual product identification systems
Answer : c)processing items as soon as they are received into a distribution center

23) What is the difference between minimal cost network flows and transportation problems?
a) The minimal cost network flows are special cases of transportation problems
b) The transportation problems are special cases of the minimal cost network flows
c) There is no difference
d) The transportation problems are formulated in terms of tableaus, while the minimal cost network flows are formulated in terms of graphs
Answer : b)The transportation problems are special cases of the minimal cost network flows

24) With the transportation technique, the initial solution can be generated in any fashion one chooses) The only restriction is that
a) the edge constraints for supply and demand are satisfied)
b) the solution is not degenerate)
c) the solution must be optimal)
d) one must use the northwest-corner method)
Answer : a) the edge constraints for supply and demand are satisfied)

25) The purpose of the stepping-stone method is to
a) develop the initial solution to the transportation problem)
b) assist one in moving from an initial feasible solution to the optimal solution)
c) determine whether a given solution is feasible or not)
d) identify the relevant costs in a transportation problem)
Answer : b. assist one in moving from an initial feasible solution to the optimal solution

26) The purpose of a dummy source or dummy destination in a transportation problem is to
a) prevent the solution from becoming degenerate)
b) obtain a balance between total supply and total demand)
c) make certain that the total cost does not exceed some specified figure)
d) provide a means of representing a dummy problem)
Answer : obtain a balance between total supply and total demand)

27) Which of the following is NOT needed to use the transportation model?
a) the cost of shipping one unit from each origin to each destination
b) the destination points and the demand per period at each
c) the origin points and the capacity or supply per period at each
d) degeneracy
Answer : d. degeneracy

28) Which of the following is a method for improving an initial solution in a transportation problem?
a) northwest-corner
b) intuitive lowest-cost
c) southeast-corner rule
d) stepping-stone
Answer : d. Stepping – stone

29) The transportation method assumes that
a) there are no economies of scale if large quantities are shipped from one source to one destination)
b) the number of occupied squares in any solution must be equal to the number of rows in the table plus the number of columns in the table plus 1)
c) there is only one optimal solution for each problem)
d) the number of dummy sources equals the number of dummy destinations)
Answer : a)there are no economies of scale if large quantities are shipped from one source to one destination)

30) Which of these statements about the stepping-stone method is best?
a) A dummy source and destination must be added if the number of rows plus columns minus 1 is not equal to the number of filled squares)
b) Only squares containing assigned shipments can be used to trace a path back to an empty square)
c) An improvement index that is a net positive means that the initial solution can be improved)
d) Only empty squares can be used to trace a path back to a square containing an assigned shipment
Answer : b)Only squares containing assigned shipments can be used to trace a path back to an empty square)

31) The net cost of shipping one unit on a route not used in the current transportation problem solution is called the ?
a) change index
b) new index
c) MODI index
d) idle index
e) Improvement index
Answer : e)Improvement index

32) The procedure used to solve assignment problems wherein one reduces the original assignment costs to a table of opportunity costs is called)
a) stepping-stone method
b) matrix reduction
c) MODI method
d) northwest reduction
e) simplex reduction
answer : b) Matrix reduction

33) The method of finding an initial solution based upon opportunity costs is called
a) the northwest corner rule
b) Vogel's approximation
c) Johanson's theorem
d) Flood's technique
Answer : b) vogels approximation

(34) The region of feasible solution in LPP graphical method is called___.
- a. Infeasible region
- b. Unbounded region
- c. Infinite region
- d. Feasible region

(35) When it is not possible to find solution in LPP, it is called as case of _____.
- a. Unknown solution
- b. Unbounded solution
- c. Infeasible solution
- d. Improper solution

(36) When the feasible region is such that the value of objective function can extend to infinity, it is

called a case of_____.

a. Infeasible solution
b. Alternate optimal
c. Unbounded solution
d. Unique solution

(37) When the constraints are a mix of 'less than' and 'greater than' it is a problem having____.

a. Multiple constraints
b. Infinite constraints
c. Infeasible constraints
d. Mixed constraints

(38) In case of an '____' constraint, the feasible region is a straight line.

a. less than or equal to
b. greater than or equal to
c. mixed
d. equal to

(39) In linear programming, unbounded solution means__. ***(April 19)***

a. Infeasible solution
b. Degenerate solution
c. Infinite solutions
d. Unique solution

[Ans.: (1 – Feasible region); (2 – Infeasible solution); (3 – Unbounded solution); (4 – Mixed constraints); (5 – equal ns)]

(40) The incoming variable column in the simplex algorithm is called _____.

(a) key column
(b) incoming column
(c) variable column
(d) important column

(41) The outgoing variable row in the simplex algorithm is called_____.

(e) outgoing row
(f) key row
(g) interchanging row
(h) basic row

(42) The intersection value of key column and key row is called_.

(i) vital element
(j) important element
(k) key element
(l) basic element

(43) The variable added to the LHS of a less than or equal to constraint to convert it into equality is called_____.

(m) surplus variable
(n) artificial variable
(o) slack variable
(p) additional variable

(44) A resource which is completely utilized is called_in simplex.

(q) null resource
(r) scarce resource
(s) zero resource
(t) abundant resource

(45) A resource which is partially utilized is called__in simplex.

(u) surplus resource
(v) extra resource
(w) available resource
(x) abundant resource

(46) The value of one extra unit of resource is called_in simplex.

(y) unit price
(z) extra price
(aa) retail price
(bb) shadow price

(47) In simplex, a maximization problem is optimal when all Delta J, i.e. $C_j - Z_j$ values are____.
(cc) Either zero or positive
(dd) Either zero or negative
(ee) Only positive
(ff) Only negative
[Ans.: (1 – key column); (2 – key row); (3 – key element); (4 – slack variable); (5 – scarce resource); (6 – abundant resource); (7 – Shadow price); (8 – Either zero or negative)

(48) To find initial feasible solution of a transportation problem the method which starts allocation from the lowest cost is called_____method.
(a) north west corner
(b) least cost
(c) south east corner
(d) Vogel's approximation

(49) In a transportation problem, the method of penalties is called ____ method.
(e) least cost
(f) south east corner
(g) Vogel's approximation
(h) north west corner

(50) When the total of allocations of a transportation problem match with supply and demand values, the solution is called_____solution.
(i) non-degenerate
(j) degenerate
(k) feasible
(l) infeasible

(51) When the allocations of a transportation problem satisfy the rim condition (m + n – 1) the solution is called_____solution.
(m) degenerate
(n) infeasible
(o) unbounded
(p) non-degenerate

(52) When there is a degeneracy in the transportation problem, we add an imaginary allocation called _____in the solution.
(q) dummy
(r) penalty
(s) epsilon
(t) regret

(53) If M + N – 1 = Number of allocations in transportation, it means___. (Where 'M' is number of rows and 'N' is number of columns)
(u) There is no degeneracy
(v) Problem is unbalanced
(w) Problem is degenerate
(x) Solution is optimal

(54) Which of the following considers difference between two least costs for each row and column while finding initial basic feasible solution in transportation?
(y) North west corner rule
(z) Least cost method
(aa) Vogel's approximation method
(bb) Row minima method
[Ans.: (1 – least cost); (2 – Vogel's approximation); (3 – feasible); (4 – non-degenerate); (5 – epsilon); (6 – There is no degeneracy); (7 – Vogel's approximation method)]

(55) If the number of rows and columns in an assignment problem are not equal than it is called _____problem.

- **(a)** prohibited
- **(b)** infeasible
- **(c)** unbounded
- **(d)** unbalanced

(56) The method of solution of assignment problems is called ___ method.

- **(e)** NWCR
- **(f)** VAM
- **(g)** LCM
- **(h)** Hungarian

(57) When a maximization assignment problem is converted in minimization problem, the resulting matrix is called_____.

- **(i)** Cost matrix
- **(j)** Profit matrix
- **(k)** Regret matrix
- **(l)** Dummy matrix

(58) The extra row or column which is added to balance an assignment problem is called_____.

- **(m)** regret
- **(n)** epsilon
- **(o)** dummy
- **(p)** extra

(59) When a particular assignment in the given problem is not possible or restricted as a condition, it is called a_____problem.

- **(q)** infeasible
- **(r)** degenerate
- **(s)** unbalanced
- **(t)** prohibited

(60) If in an assignment problem, number of rows is not equal to number of columns then_____.

- **(u)** Problem is degenerate
- **(v)** Problem is unbalanced
- **(w)** It is a maximization problem
- **(x)** Optimal solution is not possible

[Ans.: (1 – unbalanced); (2 – Hungarian); (3 – Regret matrix); (4 – Dummy); (5 – Prohibited); (6 – Problem is unbalanced)]

(61) The longest path in the network diagram is called__path.

- **(a)** best
- **(b)** worst
- **(c)** sub-critical
- **(d)** critical

(62) The second longest path in the network diagram is called_path.

- **(e)** alternate
- **(f)** feasible
- **(g)** sub-critical
- **(h)** critical

(63) Forward pass calculations are done to find___occurrence times of events.

- **(i)** exact
- **(j)** earliest
- **(k)** latest
- **(l)** approximate

(64) Backward pass calculations are done to find__occurrence times of events.

- **(m)** tentative
- **(n)** definite
- **(o)** latest
- **(p)** earliest

(65) An activity whose start or end cannot be delayed without affecting total project completion time is called_____activity.

- **(q)** dummy
- **(r)** non-critical
- **(s)** critical
- **(t)** important

(66) Floats for critical activities will be always_. ***(April 19)***

- **(u)** one
- **(v)** zero
- **(w)** highest
- **(x)** same as duration of the activity

[Ans.: (1 – Critical); (2 – Sub-critical); (3 – earliest); (4 – latest); (5 – critical); (6 – Zero)]

(67) The two types of costs involved in project crashing are_and _____costs.

- **(a)** direct and indirect
- **(b)** total and partial
- **(c)** visible and invisible
- **(d)** measurable and non-measurable

(68) In project crashing, rent and overheads are treated as_costs.

- **(e)** significant
- **(f)** insignificant
- **(g)** direct
- **(h)** indirect

(69) In project crashing, the costs associated with actual activities (e.g. manpower, materials, machinery etc.) are called_____costs.

- **(i)** visible
- **(j)** measurable
- **(k)** direct
- **(l)** indirect

(70) In project crashing, as we systematically crash the project, direct cost of project___and indirect cost of project_____.

- **(m)** increases - decreases
- **(n)** decreases - increases
- **(o)** increases - remains same
- **(p)** remain same - decreases

(71) In project crashing, as we systematically crash the project, total project cost initially_____and after the optimal point, it_____.

- **(q)** increases - decreases
- **(r)** decreases - increases
- **(s)** remains same - decreases
- **(t)** decreases - remains same

[Ans.: (1 – direct, indirect); (2 – indirect); (3 – direct); (4 – increases, decreases); (5 – decreases, increases)]

(72) The shortest possible completion time of an activity in PERT is called _____time.

(a) pessimistic
(b) optimistic
(c) most likely
(d) expected

(73) The longest possible completion time of an activity in PERT is called _____time.

(e) expected
(f) most likely
(g) pessimistic
(h) optimistic

(74) In PERT, the time estimate calculated by using formula $\frac{a + 4m + b}{6}$ is called_____time.

(i) optimistic
(j) pessimistic
(k) most likely
(l) expected

(75) In PERT, the expected project completion time is also called as ___ project completion time.

(m) average
(n) norm
(o) mean
(p) critical

(76) Fill in the blanks with '<' or '>' sign as applicable a ___ m ___ b

(a) <, >
(b) >, <
(c) >, >
(d) <, <

(77) The maximum time in which an activity will be completed assuming all possible delays and postponements is termed as_____.

(q) optimistic time
(r) most likely time
(s) pessimistic time
(t) expected time

[Ans.: (1 – optimistic); (2 – pessimistic); (3 – expected); (4 – mean); (5 – <, <); (6 – pessimistic time)]

(78) The time required by each job on each machine is called____time.

(a) elapsed
(b) idle
(c) processing
(d) average

(79) The order in which machines are required for completing the jobs is called _____.

(e) machines order
(f) working order
(g) processing order
(h) job order

(80) The time between the starting of the first job and completion of the last job in sequencing problems is called_____.

(i) total time
(j) assignment time
(k) elapsed time
(l) idle time

(81) The time during which a machine remains waiting or vacant in sequencing problem is called _____time.

(m) processing
(n) waiting
(o) idle
(p) free

(82) In sequencing problem, the order of completion of jobs is called _____.

(q) completion sequence
(r) job sequence
(s) processing order
(t) job order

(83) The total time required to complete all the jobs in a job sequencing problem is known as__.

(u) idle time
(v) processing time
(w) elapsed time
(x) processing order

[Ans.: (1 – processing); (2 – processing order); (3 – elapsed time); (4 – idle); (5 – job sequence); (6 – elapsed time)]

(84) The participants in a game are called___.

(a) clients
(b) members
(c) customers
(d) players

(85) A game having more than two players is called__game.

(e) multi-person
(f) many person
(g) n-person
(h) unknown person

(86) The outcome of the interaction of selected strategies of opponents in a game is called____.

(i) income
(j) profit
(k) payoff
(l) gains

(87) In a game, the alternatives or courses of action available to each player are called__.

(m) options
(n) choices
(o) actions
(p) strategies

(88) A situation in a game where, in the payoff matrix, maximin of row is equal to minimax of column is called_____.

(q) centre point
(r) main point
(s) saddle point
(t) equal point

(89) The various alternatives or courses of actions available to each player in a game are called as____.

(u) saddle points
(v) strategies
(w) pay-off
(x) 'n' player game

[Ans.: (1 – players); (2 – n-person); (3 – payoff); (4 – strategies); (5 – saddle point); (6 – strategies)]