Online Examinations (Even Sem/Part-I/Part-II Examinations 2020 - 2021

Course Name - –Operations Research
Course Code - MSCMC401

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Answer all the questions. Each question carry one mark.

9. 1.

Thousand answer papers have to be totaled in four hours. There are 10 regular teachers, 5 staff and 4 retired teachers who can do the job. Regular teachers can total 20 papers in an hour; staff can do 15 per hour while retired teachers can do 18 per hour. The regular teachers total the papers correctly 98% of the times while this number is 94% and 96% for staff and retired teachers. We have to use the services of at least one staff. You can assume that any person can work for a fraction of an hour also. Formulate a relevant LP problem and answer the following questions.
A relevant objective function would be to

Mark only one oval.

- Maximize the papers totaled by all of them in four hours
- Minimize the papers totaled by staff and retired teachers
- Minimize the number of papers correctly totaled by all of them
- Minimize the number of papers incorrectly totaled by all of them

10. 2.

Thousand answer papers have to be totaled in four hours. There are 10 regular teachers, 5 staff and 4 retired teachers who can do the job. Regular teachers can total 20 papers in an hour; staff can do 15 per hour while retired teachers can do 18 per hour. The regular teachers total the papers correctly 98% of the times while this number is 94% and 96% for staff and retired teachers. We have to use the services of at least one staff. You can assume that any person can work for a fraction of an hour also. Formulate a relevant LP problem and answer the following questions.
The number of constraints in the formulation is

Mark only one oval.

- 5
- 10
- 19
- 20

11. 3.

A person is in the business of buying and selling items. He has 10 units in stock and plans for the next three periods. He can buy the item at the rate of Rs 50, 55 and 58 at the beginning of periods 1, 2 and 3 and can sell them at Rs 60, 64 and 66 at the end of the three periods. He can use the money earned by selling at the end of the period to buy items at the beginning of the next period. He can buy a maximum of 200 per period. He can borrow money at the rate of 2% per period at the beginning of each period. He can borrow a maximum of Rs 8000 per period and he cannot borrow more than Rs 20000 in total. He has to pay back all the loans with interest at the end of the third period.
What is the correct objective function for this problem?

Mark only one oval.

Maximize the total money available at the end of the third period

Option 1

Maximize the total money at the end of the third period less total money borrowed

Option 2

Maximize the total money at the end of the third period less total money paid back including interest

Option 3

Maximize the number of items sold at the end of the third period

Option 4

12. 4.

A food stall sells idlis, dosas and poories. A plate of idli has 2 pieces, a plate of dosa has 1 piece while a plate of poori has 2 pieces. They also sell a "combo" which has 2 idlis and 2 poories. A kg of batter costs Rs 60 and contains twelve spoons of batter. Each piece of idli requires 1 spoon of batter and each dosa requires 1.5 spoons of batter. Each poori piece requires 1 ball of wheat dough and a kg of wheat dough that costs Rs 60 can make 20 balls of dough. The selling prices of the items are Rs 40, 60, 60 and 90 per plate respectively. The owner has Rs 800 with her and estimates the demand for the four items (in plates) as 50, 30, 20 and 10 respectively. There is a penalty cost of Rs 10 for any unmet plate of demand of an item. Idli being the most commonly consumed item, the owner wishes to meet at least 80% of the demand. Formulate an LP problem and answer the following questions:
What is the most suitable objective function for this problem?

Mark only one oval.

Option 1: Maximize the total money earned by sale

Option 2: Maximize the total money earned by sale less the cost of items bought

Option 3: Maximize the total plates made of all the items

Option 4: Minimize the unmet demand

13. 5.

Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known.
The objective function has _____ terms

Mark only one oval.

- 54
- 55
- 56
- 57

14. 6.

Consider the LP problem:
Maximize $7X_1 + 6X_2$
subject to
$X_1 + X_2 \leq 4$
$2X_1 + X_2 \leq 6$
$X_1, X_2 \geq 0$
The objective function corresponding to the optimum solution is.....

Mark only one oval.

- 24
- 26
- 28
- 30

15. 7.

Consider the LP problem:
Maximize $5X_1 + 8X_2$
subject to
$4X_1 + 5X_2 \leq 20$
$3X_1 + 2X_2 \leq 12$
$X_1 + 2X_2 \geq 3$
$X_1, X_2 \geq 0$. The number of corner points in the graphical solution is_____

Mark only one oval.

- 4
- 5
- 6
- No corner point

16. 8.

A constraint that does not affect the feasible region is a

Mark only one oval.

- Option 1: non-negativity constraint
- Option 2: slack constraint
- Option 3: redundant constraint
- Option 4: standard constraint

17. 9.

Consider the LP problem:
Maximize $5X_1 + 8X_2$
subject to
$3X_1 + 4X_2 \leq 16$
$5X_1+2X_2 \leq 12$
$X_1, X_2 \geq 0$
The corner point obtained by solving $3X_1+4X_2=16$ and $5X_1+2X_2=12$ is

Mark only one oval.

- (8/7,22/7)
- (7/8,22/7)
- (8/7,7/22)
- (7/8,7/22)

18. 10.

Consider the LP problem:
Maximize $7X_1 + 6X_2$
subject to $X_1 \leq 4$
$X_1 - X_2 \geq 0$
$X_1, X_2 \geq 0$
The objective function corresponding to the optimum solution is _____

Mark only one oval.

- 48
- 49
- 51
- 52

19. 11.

Consider the LP problem:
Minimize $5X_1 + 8X_2$
subject to
$X_1 + X_2 \leq 6$
$X_1 + X_2 \geq 2$
$X_1 - X_2 \leq 2$
$X_1 - X_2 \geq -2$
$X_1, X_2 \geq 0.$
The objective function value at optimum is ____

Mark only one oval.

- 6
- 7
- 8
- 10

20. 12.

Consider the LP problem
Minimize $3X_1 + 8X_2 + 3X_3 + 7X_4$
subject to $3X_1 + 5X_2 + X_3 \geq 16;$
$5X_1 + 3X_2 - X_4 \geq 12,$
$X_1, X_2, X_3, X_4 \geq 0.$
The number of artificial variables required to initialize the simplex table is ___

Mark only one oval.

- 1
- 2
- 3
- 4

21. 13.

Consider the LP problem
Maximize $3X_1 + 8X_2$
subject to
$3X_1 + 5X_2 \leq 16$
$5X_1 + 3X_2 \leq 12$
$X_1, X_2 \geq 0$
In the simplex algorithm, the variables that enters first is ___ and this variable replaces variable ____

Mark only one oval.

- Option 1: X_1, X_3
- Option 2: X_2, X_1
- Option 3: X_2, X_3
- Option 4: X_2, X_4

22. 14.

Consider the LP problem
Minimize $3X_1 + 8X_2$
subject to
$3X_1 + 5X_2 \geq 16$
$5X_1 + 3X_2 \geq 12$
$X_1, X_2 \geq 0.$
The number of variables in the simplex table for this problem is ____.

Mark only one oval.

- 4
- 5
- 6
- 7

23. 15.

Solve the LP problem
Maximize $9X_1 + 3X_2 + 5X_3$
subject to
$4X_1 + X_2 + X_3 \leq 12$
$2X_1 + 4X_2 + 3X_3 \leq 22$
$5X_1 + 2X_2 + 4X_3 \leq 34$
$X_1, X_2, X_3 \geq 0$ using the simplex algorithm and answer the following questions.
The value of the objective function at the optimum is _____

Mark only one oval.

- 44.6
- 44.2
- 44.8
- 44.4

24. 16.

Solve the LP problem using Simplex algorithm
Minimize $9X_1 + 3X_2$
subject to
$4X_1 + X_2 \geq 12$
$7X_1 + 4X_2 \leq 16$
$X_1, X_2 \geq 0$ using the simplex algorithm.
Which of the following is the correct answer

Mark only one oval.

- The optimum solution is (0, 4)
- The problem is unbounded
- The problem is infeasible with simplex showing artificial variable a1 = 20/7 at optimum
- The problem is infeasible with simplex showing artificial variable a1 = 3 at optimum

25. 17.

Solve the LP problem using Simplex algorithm
Minimize $2X_1 + 3X_2$
subject to
$X_1 + X_2 \geq 4$
$X_1 \leq 1$
$X_1, X_2 \geq 0$ using the simplex algorithm.
If we add the constraint $2X_1 + 3X_2 \leq 11$

The value of the objective function at the optimum is _____

Mark only one oval.

- 7
- 9
- 10
- 11

26. 18.

The primal has m constraints and n variables. The dual has ___ constraints and ___ variables

Mark only one oval.

- m,m
- n,n
- m,n
- n,m

27. 19.

If a primal constraint is an equation, the corresponding dual variable is

Mark only one oval.

- bounded
- unbounded
- unrestricted
- none of these

28. 20. In the optimum solution, if a primal variable is basic then the corresponding dual slack value is ___

Mark only one oval.

- Positive
- Negative
- Zero
- Can't be said.

29. 21.

If the primal (maximization) is unbounded the corresponding dual is _____

Mark only one oval.

- bounded
- unbounded
- infeasible
- none of these

30. 22.

If the primal (maximization) has an objective function value of 100 at the optimum, which of the following is TRUE

Mark only one oval.

- dual has an objective function value greater than 100 at optimum
- dual has an objective function value lesser than 100 at optimum
- dual has an objective function value equal to 100 at optimum
- Dual's objective function value at optimum does not depend on the objective function value of the primal

31. 23.

Consider the LP
Maximize $7X_1 + X_2$
subject to $X_1 + X_2 \leq 3$
$X_1 + X_2 \geq 2$
$X_1, X_2 \geq 0$.
Solve this primal. Use ideas from complimentary slackness and indicate which of the following is TRUE

Mark only one oval.

The dual will have an objective function not greater than 20 at the optimum

Option 1

The dual is unbounded or infeasible

Option 2

Y_1 and Y_2 are basic at the optimum for the dual

Option 3

$Y_2 = 0$ at the optimum for the dual

Option 4

32. 24. Consider a transportation problem with 3 supply points and 4 demand points. The number of constraints in the formulation is

Mark only one oval.

- 3
- 6
- 7
- 10

33. 25. In a m x n balanced transportation problem the number of allocations in a non-degenerate basic feasible solution is

Mark only one oval.

- m
- n
- mn
- m+n-1

34. 26.

If u_i and v_j represent the dual variables in the assignment formulation, the constraint set is given by

Mark only one oval.

$u_i + v_j = C_{ij}$

Option 1

$u_i + v_j \geq C_{ij}$

Option 2

$u_i + vj \leq C_{ij}$

Option 3

None of these

Option 4

35. 27. A transportation problem has a feasible solution when

Mark only one oval.

- all of the improvement indexes are positive
- all the squares are used
- the solution yields the lowest possible cost
- all demand and supply constraints are satisfied

36. 28. The total cost of the optimal solution to a transportation problem

Mark only one oval.

- ◯ is calculated by multiplying the total supply (including any dummy values) by the average cost of the cells
- ◯ cannot be calculated from the information given
- ◯ can be calculated from the original non-optimal cost, by adding the savings made at each improvement
- ◯ can be calculated based only on the entries in the filled cells of the solution

37. 29. In a minimization problem, a negative improvement index in a cell indicates that the

Mark only one oval.

- ◯ solution is optimal
- ◯ total cost will increase if units are reallocated to that cell
- ◯ total cost will decrease if units are reallocated to that cell
- ◯ current iteration is worse than the previous one

38. 30. An improvement index indicates

Mark only one oval.

- ◯ whether a method other than the stepping stone should be used
- ◯ whether a method other that the northwest corner rule should be used
- ◯ whether the transportation cost in the upper left-hand corner of a cell is optimal
- ◯ how much total cost would increase or decrease if a single unit was reallocated to that cell

39. 31. How many feasible solutions does a 5 x 5 assignment problem have?

Mark only one oval.

- 5!
- 4!
- 6!
- 3!

40. 32. How many variables does the formulation of 5 x 5 assignment problem have?

Mark only one oval.

- 20
- 25
- 30
- 35

41. 33. How many constraints does a 5 x 5 assignment problem have?

Mark only one oval.

- 8
- 10
- 12
- 15

42. 34. How many variables does the dual of 5 x 5 assignment problem have?

Mark only one oval.

- 9
- 10
- 11
- 12

43. 35. How many constraints does the dual of the 5 x 5 assignment problem have?

Mark only one oval.

- 15
- 20
- 25
- 30

44. 36. Which of the following is not a step in Hungarian algorithm?

Mark only one oval.

- Subtract row minimum from every row
- Subtract column minimum from every column
- Draw lines through ticked rows and unticked columns
- Tick unassigned rows

45. 37. The traveling salesman problem involves visiting each city how many times?

Mark only one oval.

- 1
- 2
- 3
- 4

46. 38. Mark the wrong statement.

Mark only one oval.

- Forward pass calculations yield the earliest and the latest start and finish times of various activities.
- The difference between the latest and the earliest finish times of an activity is its total float.
- Free float of an activity cannot exceed its total float.
- Determination of the earliest and the latest start time of various activities of a project is useful for proper planning of their execution.

47. 39.A weighted graph has what associated with each edge?

Mark only one oval.

- A cost
- Nothing
- Direction
- Size

48. 40. Which of the following characteristics apply to queuing system?

Mark only one oval.

- Customer population
- Arrival process
- Both Customer population and Arrival process
- Neither customer population nor arrival process

49. 41. Which of the following is not a key operating characteristics apply to queuing system?

Mark only one oval.

- Utilization factor
- percent idle time
- Average time spendingwaiting in the system and queue.
- None of these.

50. 42. Priority key discipline may be classified as

Mark only one oval.

- Finite or infinite
- Limited and unlimited
- Pre-emptive or non pre-emptive
- All of these

51. 43. Multiple servers may be

Mark only one oval.

- in parallel
- in series
- in combination of parallel and series
- All of these

52. 44. Inventories in general are build up to

Mark only one oval.

- satisfy demand during period of replenishment
- carry reserve stocks to avoid shortages
- keep pace with changing market conditions.
- All of these.

53. 45. Which costs can vary with order quantity?

Mark only one oval.

- Unit cost only
- Holding cost only
- Re-order cost only
- All of these.

54. 46. E.O.Q results in

Mark only one oval.

- Equalization of carrying cost and procurement cost
- Minimization of set up cost
- Favorable set up cost
- Reduced chances of stock outs.

55. 47. If small orders are placed frequently (rather than placing large orders frequently), then total inventory cost is

Mark only one oval.

- Reduced
- Increased
- Either reduced or increased
- Minimized

56. 48. If EOQ is calculated, but an order is then placed which is smaller than this, will the total

Mark only one oval.

- Decrease
- Increase
- Either decreased or increased
- No change

57. 49.

A person is in the business of buying and selling items. He has 10 units in stock and plans for the next three periods. He can buy the item at the rate of Rs 50, 55 and 58 at the beginning of periods 1, 2 and 3 and can sell them at Rs 60, 64 and 66 at the end of the three periods. He can use the money earned by selling at the end of the period to buy items at the beginning of the next period. He can buy a maximum of 200 per period. He can borrow money at the rate of 2% per period at the beginning of each period. He can borrow a maximum of Rs 8000 per period and he cannot borrow more than Rs 20000 in total. He has to pay back all the loans with interest at the end of the third period.
How many decision variables are in the formulation

Mark only one oval.

- 3
- 6
- 9
- 10

58. 50.

A food stall sells idlis, dosas and poories. A plate of idli has 2 pieces, a plate of dosa has 1 piece while a plate of poori has 2 pieces. They also sell a "combo" which has 2 idlis and 2 poories. A kg of batter costs Rs 60 and contains twelve spoons of batter. Each piece of idli requires 1 spoon of batter and each dosa requires 1.5 spoons of batter. Each poori piece requires 1 ball of wheat dough and a kg of wheat dough that costs Rs 60 can make 20 balls of dough. The selling prices of the items are Rs 40, 60, 60 and 90 per plate respectively. The owner has Rs 800 with her and estimates the demand for the four items (in plates) as 50, 30, 20 and 10 respectively. There is a penalty cost of Rs 10 for any unmet plate of demand of an item. Idli being the most commonly consumed item, the owner wishes to meet at least 80% of the demand. Formulate an LP problem and answer the following questions:
How many constraints are in the formulation.

Mark only one oval.

- 3
- 4
- 5
- 6

59. 51.

Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known.
The total number of variables in the formulation is _____

Mark only one oval.

- 58
- 57
- 55
- 53

60. 52.

Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known.
The constraint to meet the demand of day 10 will have _____ terms.

Mark only one oval.

- 20
- 25
- 30
- 35

61. 53.

Consider the media selection problem with n possible things to invest in. Examples could be TV, radio, newspaper etc. There is a total budget restriction and limit on investment in each.
The number of decision variables is _____

Mark only one oval.

- n-1
- n-2
- n
- n+1

62. 54.

Consider the media selection problem with n possible things to invest in. Examples could be TV, radio, newspaper etc. There is a total budget restriction and limit on investment in each.
The number of constraints is _____

Mark only one oval.

- n
- n+1
- n+2
- n+3

63. 55.

Consider the LP problem:
Maximize $7X_1 + 6X_2$
subject to $X_1 + X_2 \leq 4$
$2X_1 + X_2 \leq 6$
$X_1, X_2 \geq 0.$
Solve by algebraic method and answer the following:
The number of basic solutions is _____

Mark only one oval.

- 1
- 4
- 2
- 6

64. 56.

Consider the LP problem:
Maximize $7X_1 + 6X_2$
subject to $X_1 + X_2 \leq 4$
$2X_1 + X_2 \leq 6$
$X_1, X_2 \geq 0.$
Solve by algebraic method and answer the following:
The number of basic feasible solutions is _____

Mark only one oval.

- 1
- 2
- 3
- 4

65. 57.

Consider the LP problem:
Maximize $7X_1 + 6X_2$
subject to $X_1 + X_2 \leq 4$
$2X_1 + X_2 \leq 6$
$X_1, X_2 \geq 0.$
Solve by algebraic method and answer the following:
If we solve for X_2 and X_3 as basic and the other variables as non-basic, the value of X_3 is _____

Mark only one oval.

- 0
- 2
- -2
- 1

66. 58.

Consider the LP problem:
Maximize $7X_1 + 6X_2 + 4X_3$
subject to
$X_1 + X_2 + X_3 \leq 5$
$2X_1 + X_2 + 3X_3 \leq 10$
$X_1, X_2, X_3 \geq 0.$
Solve by algebraic method and answer the following:
The number of basic solutions is _____

Mark only one oval.

- 8
- 9
- 10
- 11

67. 59.

Consider the LP problem:
Maximize $7X_1 + 6X_2 + 4X_3$
subject to
$X_1 + X_2 + X_3 \leq 5$
$2X_1 + X_2 + 3X_3 \leq 10$
$X_1, X_2, X_3 \geq 0.$
Solve by algebraic method and answer the following:
The number of basic infeasible solutions is _____

Mark only one oval.

- 1
- 2
- 3
- 4

68. 60.

Consider the LP problem:
Maximize $7X_1 + 6X_2 + 4X_3$
subject to
$X_1 + X_2 + X_3 \leq 5$
$2X_1 + X_2 + 3X_3 \leq 10$
$X_1, X_2, X_3 \geq 0.$
Solve by algebraic method and answer the following:
The number of unique basic feasible solutions is _____

Mark only one oval.

- 3
- 4
- 5
- 6

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