REV-01
MSM/33/17/21

2022/12

SET A

M.Sc. MATHEMATICS
THIRD SEMESTER
OPERATION RESEARCH
MSM – 305B

[USE OMR SHEET FOR OBJECTIVE PART]

Duration : 3 hrs. **Full Marks : 70**

Objective

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1X20=20***

1. Operations Research approach is _____.
   a. multi-disciplinary
   b. scientific
   c. intuitive
   d. collect essential data
2. A feasible solution to a linear programming _____
   a. must satisfy all the constraints of the problem simultaneously
   b. need not satisfy all of the constraints, only some of them
   c. must be a corner point of the feasible region
   d. must optimize the value of the objective function
3. If any value XB Column of final table is negative, then the solution is _____
   a. feasible
   b. infeasible
   c. bounded
   d. No solution
4. The difference between total float and head event slack is _____
   a. free float
   b. independent float
   c. interference float
   d. linear float
5. A mixed strategy game can be solved by_____
   a. Simplex method
   b. Hungarian method
   c. Graphical method
   d. Degeneracy
6. For any primal problem and its dual_____.
   a. optimal value of objective function is same
   b. dual will have an optimal solution iff primal does too
   c. primal will have an optimal solution iff dual does too
   d. both primal and dual cannot be infeasible
7. An optimal assignment requires that the maximum number of lines which can be drawn through squares with zero opportunity cost should be equal to the number of _____.
   a. Rows or columns
   b. Rows and columns.
   c. Rows+columns- 1
   d. Rows-columns.
8. To proceed with the Modified Distribution method algorithm for solving a transportation problem, the number of dummy allocations need to be added are_____.
   a. n
   b. n-1
   c. 2n-1
   d. n-2

9. A petrol pump has one pump; Vehicles arrive at the petrol pump according to poison input process at average of 12 per hour. The service time follows exponential distribution with a mean of 4 minutes. The pumps are expected to be idle for _____.

a. $\frac{3}{5}$
b. $\frac{4}{5}$
c. $\frac{5}{3}$
d. $\frac{6}{5}$

10. A set of feasible solution to a Linear Programming Problem is _____
a. Convex
b. Polygon
c. Triangle
d. Bold

11. In a Linear Programming Problem functions to be maximized or minimized are called _____.
a. constraints
b. Objective function
c. Basic Solution
d. Feasible Solution

12. Using _____ method, we can never have an unbounded solution
a. Simplex
b. Dual Simplex
c. Big M
d. Modi

13. The customers of high priority are given service over the low priority customers is _____.
a. Pre emptive
b. FIFO
c. LIFO
d. SIRO

14. The assignment problem is always a _____matrix
a. Circle
b. Square
c. Rectangle
d. Triangle

15. The minimum number of lines covering all zeros in a reduced cost matrix of order n can be _____
a. at the most n
b. At the least n
c. n-1
d. n+1

16. The transportation problem deals with the transportation of _____.
a. a single product from a source to several destinations
b. single product from several sources to several destinations
c. a single product from several sources to a destination
d. a multi -product from several sources to several destinations

17. Maximization assignment problem is transformed into a minimization problem by_____.
a. adding each entry in a column from the maximum value in that column
b. subtracting each entry in a column from the maximum value in that column
c. subtracting each entry in the table from the maximum value in that table
d. adding each entry in the table from the maximum value in that table

18. Mathematical model of linear programming problem is important because _____.

a. it helps in converting the verbal description and numerical data into mathematical expression
b. decision makers prefer to work with formal models
c. it captures the relevant relationship among decision factors
d. it enables the use of algebraic technique

19. The slack variables indicate _____.

a. Excess resource available.
b. shortage of resource
c. nil resource
d. idle resource

20. The assignment algorithm was developed by _____

a. Hungarian
b. Vogel's
c. Modi
d. Traveling Sales man

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Descriptive

Time : 2 hrs. 30 mins. Marks : 50

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

1. a. Describe briefly use of operation Research (OR) in India? 5+5=10

b. Solve the following question graphically

A firm uses lather, milling machines and grinding machines to produce two machine parts. Following table represents the machining lines required for each part, the machining times available on different machining and the profit on each machine part.

Types of machine	Machining time the required for machine part(minutes)		Maximum time available per week (Minutes)
	I	II	
Lather	12	6	3,000
Milling Machines	4	10	2,000
Grinding Machine	2	3	900
Profit per unit	Rs. 40	Rs. 100	

2. a. Solve the following LPP using simplex method 5+5=10

Maximization $Z = 12x_1 + 16x_2$

Subject to the

$10x_1 + 20x_2 \leq 120$

$8x_1 + 8x_2 \leq 80$

$x_1, x_2 \geq 0$

b. Solve the LPP by two phase method

Minimization $Z = 10x_1 + 6x_2 + 2x_3$

Subject to the constrain

$-x_1 + x_2 + x_3 \geq 1$

$3x_1 + x_2 - x_3 \geq 2$

$x_1, x_2, x_3 \geq 0$

3. a. Solve the LPP by BIG M method **5+5=10**

Minimum $Z = 7x_1 + 15x_2 + 20x_3$

Subject to the constrain

$2x_1 + 4x_2 + 6x_3 \geq 24$

$3x_1 + 9x_2 + 6x_3 \geq 30$

$x_1, x_2, x_3 \geq 0$

b. Solve the LPP by graphically

Minimize $Z = -x_1 + 2x_2$

Subject to the constrain

$-x_1 + 3x_2 \leq 10$

$x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2$

$x_1, x_2 \geq 0$

4. Monte Carlo Simulation: **4+6=10**

A bakery keeps stock of a popular brand of Cake daily demand based on past experience is given below

Daily demand	1	15	25	35	45	50
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Consider the following sequence of random numbers

48	78	09	51	56	77	15	14	68	2	69

a. Using the sequence, simulate the demand for the next 10 days

b. Find the stock simulation if the owner of the bakery decides to make 35 cakes every day. Also estimate the daily average demand for the cakes on the basis of the simulated data.

5. A company has one surplus truck in each of the cities A, B, C, D, E and one deficit truck in each cities 1, 2, 3, 4, 5, 6. The distance between the cities in Km are shown in the below table. Find assignment of trucks from the cities in surplus two cities in deficit, so that the total distance covered by the vehicle is minimize. **10**

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

6. Solve the following data by 5+5=10

   a. north west corner method (NWCM) and
   b. least cost method (LCM)

	D1	D2	D3	Demand
S1	4	8	8	150
S2	12	8	11	100
S3	10	6	3	250
Supply	50	150	300	

7. Determine whether the functions are convex, concave or neither 5+5=10

   a. $f(x) = 3x_1 + 2x^2{}_1 + 4x_2 + x_2{}^2 - 2x_1x_2$
   b. $f(x) = x_1{}^2 + 3x_1x_2 + 2x_2{}^2$

8. A project schedule has the following characteristics 3+4+3=10

Activity	Time (weeks)	Activity	Time(Week)
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	5	9-10	7

   a. Construct the network.
   b. Compute E and L for each event, and
   c. Find the critical path

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