Avinashilingam Institute for Home Science and Higher Education for Women

(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956)
Re-accredited with 'A+' Grade by NAAC. Recognised by UGC Under Section 12B
Coimbatore - 641 043, Tamil Nadu, India

Bachelor's Degree Examination –August 2020
VI Semester

Class : III UG **Time : 2 Hours**
Major : Special Education and Mathematics **Max. Marks : 50**

15BSMC16 Operations Research

Part A **10 x 1 = 10**
Choose the Correct Answer

1. Graphical method is used to solve LPP's with ____ variables.
   a. one b. two
   c. three d. any number of

2. Any feasible solution which optimizes the objective function of the LPP is called
   a. feasible b. optimal
   c. infeasible d. bounded

3. A basic solution is said to be non-degenerate basic solution if ------- of the basic variables is zero.
   a. One b. None
   c. two or more d. all

4. The intersection of the pivot column and pivot row is called the
   a. slack b. key element
   c. surplus d. artificial

5. If the primal contains m constraints and n variables, then the dual will contain ----and ---- .
   a. n constraints m variables b. m constraints m variables
   c. m constraints n variables d. n constraints n variables

6. In phase I, the iterations are stopped as soon as the value of new objective functions becomes
   a. zero b. greater than zero
   c. less than zero d. infinity

7. In transportation problem, which method gives the best result.
   a. North – West corner b. Least cost method
   c. VAM d. MODI's

8. If the number of non-negative allocations is less than m+n-1,then the basic feasible solution is
   a. Optimal b. Bounded
   c. Degenerate d. Non-degenerate

9. The assignment problem is said to be balanced if the given matrix is
   a. singular b.identity
   c. triangular d. square

10. If there were n workers & n jobs there would be
    a. n! Solutions b. $(n!)^n$ solutions
    c. (n-1)! Solutions d. n solution

Part B **3 x 6 = 18**

Answer any **Three** questions

Each answer should not exceed 400 words or two pages

11. A company has three operational departments(weaving, processing and packing) with capacity to produce three different types of clothes namely suitings, shirtings and woollens yielding a profit of Rs.2,Rs.4 and Rs.3per meter respectively. One meter of suiting requires 3 minutes in weaving 2 minutes in processing and 1 minute in packing. Similarly one meter of shirting require 4 minutes in weaving 1 minutes in processing and 3 minutes in packing. One meter of woollen requires 3 minutes in each department .In a week, total run time of each department is 60,40 and 80 hours for weaving, processing and packing respectively. ***Construct*** LPP so as to maximize the profit.

12. Express the following LPP in canonical form

Maximize $Z = 3x + y$ subject to

$x + 2y \geq -5$; $3x + 5y \leq 6$ and $x, y \geq 0$

13. Explain the degeneracy case in LPP.

14. Use simplex method to ***solve*** the LPP

Maximize $Z=4x_1 +10 x_2$. subject to $2x_1 + x_2 \leq 50$;

$2x_1 + 5x_2 \leq 100$; $2x_1 + 3x_2 \leq 90$ and $x_1 , x_2 \geq 0$

15. Explain the formulation of a Dual problem.

16. Write the dual to the following LPP:

Maximize $Z=x_1 - x_2+ 3x_3$ subject to the constraints:

$x_1 + x_2 + x_3 \leq 10$; $2x_1 – x_3 \leq 2$; $2x_1-2x_2+ 2x_3 \leq 6$ and $x_1 , x_2, x_3 \geq 0$

17. Find the starting solution in the following transportation problem by NWCR method.

	D_1	**D_2**	**D_3**	**D_4**	**supply**
S_1	11	13	17	14	250
$S_{2,}$	16	18	14	10	300
$S_{3,}$	21	24	13	10	400
Demand	200	225	275	250	

18. Determine basic feasible solution for the following Transportation problem by LCM.

					supply
	1	2	3	4	**6**
	4	3	2	0	**8**
	0	2	2	1	**9**
Demand	**4**	**6**	**8**	**6**	

19. The Assignment Cost of assigning anyone operator to anyone machine is given in the following table. Find the optimal assignment cost.

Operators					
		I	II	III	IV
Machine	A	9	26	17	11
	B	13	28	4	26
	C	38	19	18	15
	D	19	26	24	10

20**.** Solve the assignment problem.

$$\begin{pmatrix} 16 & 10 & 14 & 11 \\ 14 & 11 & 15 & 15 \\ 15 & 15 & 13 & 12 \\ 13 & 12 & 14 & 15 \end{pmatrix}$$

Part C **2 x 11 = 22**

Answer any **Two** questions

Each answer should not exceed 800 words or four pages

21. Solve by Graphical method:
Min Z = $3x_1 + 2x_2$ subject to the constraints $5x_1+x_2 \geq 10$; $x_1+x_2 \geq 6$; $x_1+4x_2 \geq 12$ and $x_1, x_2 \geq 0$.

22. A firm manufactures two products A and B on which the profits earned per unit are Rs. 3 and Rs. 4 respectively. Each product is processed on two machines M_1 and M_2.Product A requires one minute of processing time on M_1 and two minutes on M_2 while B requires one minute on M_1 and one minute on M_2. Machine M_1 is available for not more than 7 hours and 30 minutes, while machine M_2 is available for 10 hours during any working day. Find the number of units of products A and B to be manufactured to get maximum profit.

23. Solveby Simplex method: Max Z = $3x_1+2x_2+5x_3$ subject to $x_1 + 4x_2 \leq 420$; $3x_1 + 2x_2 \leq 460$; $x_1 + 2x_2 + x_3 \leq 430$;$x_1, x_2, x_3 \geq 0$.

24. Briefly explain the uses of Artificial variables and Degeneracy in LPP.

25. Use duality to solve the following LPP:
Maximize Z = $2x_1 + x_2$ subject to the constraints $x_1+ 2x_2 \leq 10$; $x_1+x_2 \leq 6$; $x_1 - x_2 \leq 2$, $x_1 - 2x_2 \leq 2$ and $x_1, x_2 \geq 0$.

26. Explain the dual simplex algorithm.

27. Solve the transportation by MODI method (Find initial solution by VAM) .

Destinations						
Origin		A	B	C	D	Supply
	P	11	13	17	14	250
	Q	16	18	14	10	300
	R	21	24	13	10	400
	Demand	200	225	275	250	

28. Solve the following transportation problem .

	I	II	III	Supply
A	5	6	9	100
B	3	5	10	75
C	6	7	6	50
D	6	4	10	75
Demand	70	80	120	

29**.** Solve the assignment problem .

	Job				
Person	**1**	**2**	**3**	**4**	**5**
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

30. Solvethe following assignment model.

	MEN				
TASK		I	II	III	IV
	A	18	24	28	32
	B	8	13	17	19
	C	10	15	19	22

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