U.G. DEGREE EXAMINATION, APRIL 2021 &

Supplementary / Improvement/ Arrear Examinations

Information Technology

Allied – OPERATION RESEARCH

(CBCS – 2017 onwards)

Time : 3 Hours   Maximum : 75 Marks

Part A   (10 × 2 = 20)

Answer **all** questions.

1. Define OR.

2. State Descriptive Model.

3. What are the essential characteristics of LPP?

4. What is Optimum Basic Feasible Solution?

5. Define Gomeory's Constraint.

6. State Zew-one integer programming problem.

7. What is Assignment Problem?

8. Name the solution methods of assignment problem?

9. What is Transportation Problem?

10. Describe an unbalanced Transportation Table.

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the main Phases of Operation Research.

Or

(b) Name some of the tools of Operation Research. Discuss with examples.

12. (a) A company makes two kinds of leather belts. Belt A is a high quality belt, and belt B is of lower quality. The respective profits are Rs.4.00 and Rs.3.00 per belt. Each belt of type A requires twice as much time as a belt of type B, and if all belts were of type B, the company could make 1000 belts per day. The supply of leather is sufficient for only 800 belts per day (Both A and B combined). Belt A requires a fancy buckle and only 400 buckles per day are available. There are only 700 buckles a day available for belt B.

Determine the optimal product mix.

Or

(b) Use simplex method to solve the following LPP.

Maximize $Z = 4x_1 + 10x_2$

Subject to the constraints

$2x_1 + x_2 \leq 50$
$2x_1 + 5x_2 \leq 100$
$2x_1 + 3x_2 \leq 90$ where $x_1 \geq 0$ and $x_2 \geq 0$

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13. (a) Formulate the dual of the following Linear programming problem:

Maximize $Z = 5x_1 + 3x_2$

Subject to the constraints

$3x_1 + 5x_2 \leq 15$

$5x_1 + 2x_2 \leq 10$ where $x_1 \geq 0$ and $x_2 \geq 0$

Or

(b) Use Dual simplex method to solve the following L.P.P

Minimize $Z = 3x_1 + x_2$

Subject to the constraints

$x_1 + x_2 \geq 1$

$2x_1 + 3x_2 \geq 2$ where $x_1, x_2 \geq 0$.

14. (a) A Pharmaceutical company is producing a single product and is selling it through five agencies located in different cities. All of a sudden, there is a demand for the product in another five cities not having any agency of the company. The company is faced with the problem of deciding on how to assign the existing agencies to despatch the product to needy cities in such a way that the travelling distance is minimized. The distance between the surplus and deficit cities (in km) is given in the following table:

	a	b	c	d	E
A	85	75	65	125	74
B	90	78	66	132	78
C	75	66	57	114	69
D	80	72	60	120	72
E	76	64	26	112	68

Or

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(b) A machine operator processes five types of items on his machines each week, and must choose a sequence for them. The set-up cost per change depends on the item presently on the machine and the set-up to be made according to the following table:

From Item	To Item				
	A	B	C	D	E
A	∞	4	7	3	4
B	4	∞	6	3	4
C	7	6	∞	7	5
D	3	3	7	∞	7
E	4	4	5	7	∞

If the processes each type of item once and only once each week, how should he sequence the items on his machine in order to minimize the total set up cost?

15. (a) Obtain an initial basic feasible solution to the following Transportation Problem using the matrix minima method:

	D1	D2	D3	D4	Capacity
O1	1	2	3	4	6
O2	4	3	2	0	8
O3	0	2	2	1	10
Demand	4	6	8	6	

Or

(b) Use Vogel's approximation method to obtain an initial basic feasible solution of the transportation problem

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

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Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. Elucidate the following
    (a) OR Techniques
    (b) OR Features

17. Use Big M method to

    Maximize $Z = 2x_1 + x_2 + 3x_3$

    Subject to the constraints

    $x_1 + x_2 + 2x_3 \leq 5,$

    $2x_1 + 3x_2 + 4x_3 = 12$ where $x_1, x_2, x_3 \geq 0$.

18. Use branch and bound method to solve the following L.P.P.

    Maximize $Z = 7x_1 + 9x_2$

    Subject to the constraints

    $-x_1 + 3x_2 \leq 6,$

    $7x_1 + x_2 \leq 35.$

    $X_2 \leq 7$ where $x_1, x_2 \geq 0$ and are integers.

19. Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows:

		Jobs				
		I	II	III	IV	V
	A	2	9	2	7	1
	B	6	8	7	6	1
Men	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

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20. Find the optimum solution in the following transportation problem by Vogel's approximation method. Also obtain the optimal solution.

	D_1	D_2	D_3	D_4	Supply
S_1	3	7	6	4	5
S_2	2	4	3	2	2
S_3	4	3	8	5	3
Demand	3	3	2	2	

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