F–6221

Sub. Code
7BITA4

U.G. DEGREE EXAMINATION, NOVEMBER 2021

Information Technology

Allied : OPERATION RESEARCH

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

1. State any two features of OR.
2. What is Predictive model?
3. Describe Degenerate Solution.
4. What is Unbounded Solution?
5. Define Integer Programming Problem.
6. State Primal Problem.
7. Define Hungarian Assignment Method.
8. What is Travelling Salesman Problem?
9. What is balanced Transportation Problem?
10. List the methods to find Initial basic feasible solution.

Part B $(5 \times 5 = 25)$

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

11. (a) Briefly Explain the general methods for solving Operation Research models.

Or

(b) Describe briefly the different phases of Operation Research.

12. (a) A farm is engaged in breeding pigs. The pigs are fed on various products grown on the farm. In view of the need to ensure certain nutrient constituents (call them X,Y and Z), it is necessary to buy two additional products, say, A and B. One unit of product A contains 36 units of X, 3 units of Y and 20 units of Z. One unit of product B contains 6 units of X, 12 units of Y and 10 units of Z. The minimum requirement of X, Y and Z is 108 units, 36 units and 100 units respectively. Product A costs Rs.20 per unit and product B Rs.40 per unit. Formulate the above as a linear programming problem to minimize the total cost, and solve the problem by using graphic method.

Or

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

Minimum $Z = x_2 - 3x_3 + 2x_5$

Subject to the constraints

$$3x_2 - x_3 + x_5 \le 7$$
$$-2x_2 + 4x_3 \le 12$$
$$-4x_2 + 3x_3 + 8x_5 \le 10$$

Where $x_2, x_3, x_5 \ge 0$

13. (a) Formulate the dual of the following L.P.P

Maximize $Z = 10x_1 + 8x_2$

Subject to the constraints

$x_1 + 2x_2 \geq 5$

$2x_1 - x_2 \geq 12$

$x_1 + 3x_2 \geq 14$

Where $x_1 \geq 0$ and x_2 is unrestricted.

Or

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

Minimize $Z = 3x_1 + 2x_2 + x_3 + 4x_4$

Subject to the constraints

$2x_1 + 4x_2 + 5x_3 + x_4 \geq 10$

$3x_1 - x_2 + 7x_3 - x_4 \geq 2$

$5x_1 + 2x_2 + x_3 + 6x_4 \geq 15$

Where

$x_1, x_2, x_3, x_4 \geq 0$

14. (a) Four professors of each capable of teaching any one of four different courses Class preparation time in hours for different topics varies from professor and is given in the table below. Each professor is assigned only one course. Determine an assignment schedule so as to minimize the total course preparation time for all courses:

Professor	Linear Programmes	Queuing Theory	Dynamic Programme	Regression Analysis
A	2	10	9	7
B	15	4	14	8
C	13	14	16	11
D	4	15	13	9

Or

(b) A salesman is planning to tour cities B, C. D and E starting from his home city A. The inter-city distances are shown in the following table:

City	A	B	C	D	E
A	∞	103	1588	136	38
B	103	∞	262	176	52
C	188	262	∞	85	275
D	136	176	85	∞	162
E	38	52	275	162	∞

How should he plan his tour so that

(i) he visits each of the cities only once, and

(ii) travels the minimum distance

15. (a) Obtain an initial basic feasible solution to the following Transportation Problem using the North West corner rule.

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

Or

(b) Obtain an initial basic feasible solution to the following transportation problem using the Vogel's approximation method:

	Stores				
	I	II	III	IV	Availability
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	-1	4	2	19
Requirement	21	25	17	17	80

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

Answer any **three** questions.

16. Briefly describe the scope of Operation Research.

17. Use two phase simplex method to

Maximize $Z = 5x_1 + 8x_2$

Subject to constraints :

$2x_1 + x_2 \geq 2$
$x_1 + 3x_2 \leq 2$

$x_2 \leq 4$ Where $x_1, x_2 \geq 0$

18. Use branch and bound method to solve the following linear programming problem:

Maximize $Z = 2x_1 + 3x_2$

Subject to the constraints

$x_1 + x_2 \le 7$
$0 \le x_1 \le 5$
$0 \le x_2 \le 4$

Where x_1, x_2 are integers.

19. Consider the problem of assigning five operators to five machines. The Assignment costs are given below:

Machines

Operators	A	B	C	D	E
I	10	3	10	7	7
II	5	9	7	11	9
III	13	18	2	9	10
IV	15	3	2	7	4
V	16	6	2	12	12

Assign the operators to different machines so that total cost is minimised.

20. ABC Limited has three production shops supplying a product to five warehouses. The cost of production varies from shop to shop and cost of transportation from one shop to a warehouse also varies. Each shop has a specific production capacity and each warehouse has certain amount of requirements. The costs of transportation are as given below.

	Warehouse					
Shop	I	II	III	IV	V	Supply
A	6	4	4	7	5	100
B	5	6	7	4	8	125
C	3	4	6	3	4	175
Demand	60	80	85	105	70	400

The cost of manufacture of the product at different production shop is:

Shop	Variable cost	Fixed cost
A	14	7000
B	16	4000
C	15	5000

Find the optimum quantity to be supplied from each shop to different warehouses at minimum total cost.