29. Solve by dual-simplex method

Maximize $z = 2x_1 + x_2$

Subject to the constraints $x_1 + 2x_2 \leq 10;$

$x_1 + x_2 \leq 6;$

$x_1 - x_2 \leq 2;$

$x_1 - 2x_2 \leq 1;$

$x_1 \geq 0\,, x_2 \geq 0.$

30. Solve the transportation problem.

	D_1	D_2	D_3	D_4	Supply
O_1	3	7	6	4	5
O_2	2	4	3	2	2
O_3	4	3	8	5	3
Demand	3	3	2	2	

31. (a) Explain the Traveling Salesman Problem.

(b) Solve the following Traveling Salesman Problem so as to minimize the cost per cycle.

Jobs	To				
	A	B	C	D	E
A	_	3	6	2	3
B	3	_	5	2	3
C	6	5	_	6	4
D	2	2	6	_	6
E	3	3	4	6	_

32. A small project consists of seven activities for which the relevant data are as given below:

Activity	Preceding Activities	Activity Duration(Days)
A	_	4
B	_	7
C	_	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

(i) Draw the network and find the project completion time.

(ii) Calculate total float for each of the activities.

(iii) Draw the time scaled diagram. **(3 x 10= 30 Marks)**

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18U204 (Pages: 4) Name……

Reg. No……

SECOND SEMESTER B.C.A. DEGREE EXAMINATION, APRIL 2019

(CUCBCSS – UG)

CC17U BCA2 C04 – OPERATIONS RESEARCH

Mathematics – Complementary course

(2017 Admission onwards)

Time: Three Hours Maximum: 80 Marks

PART A

Answer ***all*** questions. Each question carries 1 mark.

1. Define slack and surplus variables in a Linear Programming Problem.
2. Define basic feasible solution of a Linear Programming Problem.
3. What do you understand about artificial variable in an LPP?
4. What is the necessary and sufficient condition for the existence of the feasible solution of the general transportation problem?
5. What do you understand about loop in transportation problem?
6. What is transhipment problem?
7. How do you convert a maximization assignment problem to minimization problem?
8. Define critical path of a Network.
9. What is idle time on a machine?
10. What is no passing rule in sequencing problem?

(10 x 1= 10 Marks)

PART B

Answer ***all*** questions. Each question carries 2 marks.

11. Write the following LPP to standard form

$Maximize\ Z = 3x_1 - 3x_2$

$subject\ to\ x_1 - 2x_2 \leq -3;$

$4x_1 + x_2 \leq 4;$

$x_1\,, x_2 \geq 0$

12. Explain the two-phase method to solve a Linear Programming Problem.
13. Is the number of constraints in the primal and dual problems same? Justify.
14. Write algorithm for Vogel's Approximation Method to obtain an initial basic feasible solution of the transportation problem.
15. How does the problem of degeneracy arise in a transportation problem? Explain how does one overcome it?
16. Give the mathematical formulation of an assignment problem.

17. Write the following assignment problem as a transportation problem.

	A_1	A_2	A_3
R_1	1	2	3
R_2	4	5	1
R_3	2	1	4

18. What is meant by graphing in Network Analysis?

(8 x 2 = 16 Marks)

PART C

Answer any ***six*** questions. Each question carries 4 marks.

19. A company sells two different products A and B. The company makes a profit of $Rs.40$ and $Rs.30$ per units on products A and B respectively. The two products are produced in a common production prcess and are sold in two different markets. The production process has a capacity of 30000 man hours. It takes 2 hours to produce one unit A and *one hour* to produce one unit B. The market has been surveyed, and the company officials feels that the maximum number of units of A that can be sold is 8000 and the maximum units of B is 12000 units. Subject to these limitations, the product can be sold in any convex combination. Formulate this problem as a LP Problem.

20. Find all basic solutions to the system of linear equations $x_1 + 2x_2 + x_3 = 4$;
$2x_1 + x_2 + 5x_3 = 5$, Are the solutions degenerate.

21. Use simplex method to solve the LPP:

Maximize $Z = 3x_1 + 2x_2$

Subject to $4x_1 + 3x_2 \leq 12$

$4x_1 + x_2 \leq 8$

$4x_1 - x_2 \leq 8$

$x_1, x_2 \geq 0$

22. Use Big M- method to solve:

Maximize $z = -x_1 - x_2 - x_3$

Subject to the constraints $x_1 - x_2 - 2x_3 = 2$

$x_1 + 2x_2 - x_3 = 1$

$x_1, x_2, x_3 \geq 0$

23. Using North West Corner Rule find the initial basic feasible solution of

	D_1	D_2	D_3	Availability
O_1	3	2	5	6
O_2	9	1	2	10
O_3	4	3	1	12
Requirments	9	16	3	

24. Obtain an initial basic feasible solution to the following transportation problem by matrix minima method.

	D_1	D_2	D_3	D_4	Capacity
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	2	2	1	10
Demand	4	6	8	6	

25. Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows. Determine the optimum assignment schedule.

		Job				
		1	**2**	**3**	**4**	**5**
Persons	**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

26. Distinguish between PERT and CPM in network analysis.

27. Use graphic method to find the minimum elapsed total time sequence of 2 jobs and 5 machines, when we are given the following information:

Job 1	$Sequence$	A	B	C	D	E
	$Time\ (in\ hours)$	2	3	4	6	2
Job 2	$Sequence$	C	A	D	E	B
	$Time\ (in\ hours)$	4	5	3	2	6

(6 x 4= 24 Marks)

PART D

Answer any ***three*** questions. Each question carries 10 marks.

28. Use simplex method to solve,

Minimize $z = x_1 - 3x_2 + 2x_3$

Subject to $3x_1 - x_2 + 2x_3 \leq 7;$

$-2x_1 + 4x_2 \leq 12;$

$-4x_1 + 3x_2 + 8x_3 \leq 10;$

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