29. Solve by two phase method.

$$\begin{aligned} \textit{Maximize } Z &= -x_1 - x_2 - x_3 \\ \textit{Subject to } \quad x_1 + 2x_2 - x_3 &= 1 \\ x_1 - x_2 - 2x_3 &= 2 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

30. Solve the following transportation problem.

	D_1	D_2	D_3	D_4	
O_1	3	8	9	16	8
O_2	6	11	14	9	9
O_3	5	13	10	12	13
	6	7	7	10	

31. Solve the following travelling salesman problem so as to minimize the cost per cycle.

	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	∞

32. Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order ABC:

Processing Time (Hours)	Job					
	1	2	3	4	5	6
Machine A	12	10	9	14	7	9
Machine B	7	6	6	5	4	4
Machine C	6	5	6	4	2	4

Also compute the total elapsed time and idle time for all the three machines.

(3 × 10 = 30 Marks)

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21U204S (Pages: 4) Name: ………………………

Reg. No: ……………………

SECOND SEMESTER B.C.A. DEGREE EXAMINATION, APRIL 2022

(CUCBCSS – UG)

CC17U BCA2 C04 – OPERATIONS RESEARCH

(Computer Application – Complementary Course)

(2017, 2018 Admissions – Supplementary/Improvement)

Time: Three Hours Maximum: 80 Marks

Part - I

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

1. Write the standard form of and canonical form of an LPP.
2. Write the difference between primal and dual problems in LPP.
3. For maximization LPP, the objective function coefficient for an artificial variable is…
4. When a transportation problem is said to be unbalanced?
5. How do you convert a maximization transportation problem to minimization problem?
6. What do you mean by a prohibited assignment problem?
7. Define lopping and dangling of a network.
8. Define pessimistic and optimistic time of activities associated with network problems.
9. Define idle time on a machine in a sequencing problem.
10. What is the condition for the existence of an optimal solution for the sequencing problem of assigning n jobs through 3 machines?

(10 × 1 = 10 Marks)

Part - II

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

11. What are the limitations of OR models?
12. Write the dual of the LPP

$$\begin{aligned} \textit{Maximize } \quad Z &= 5x_1 + 3x_2 \\ \textit{subject to } \quad 3x_1 + 5x_2 &\leq 15 \\ 5x_1 + 2x_2 &\leq 10 \\ x_1, x_2 &\geq 0 \end{aligned}$$

13. Write the algorithm for North-West Corner method.
14. Distinguish between PERT and CPM.
15. Describe basic components of network.
16. Convert the following maximization assignment problem in to minimization problem.

	I	II	III	IV
A	12	2	18	14
B	3	11	14	25
C	10	25	19	5

17. Solve the following assignment problem.

	A	B	C
I	5	8	3
II	6	2	7
III	1	1	3

18. Find an optimum sequence for performing jobs for the following sequencing problem.

Job	I	II	III	IV	V
Machine A	5	1	9	3	10
Machine B	2	6	7	8	4

(8 × 2 = 16 Marks)

Part - III

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

19. What are the advantages and applications of OR models?
20. Explain Big-M method of solving a LPP.
21. Solve the following LPP by simplex method.

Maximize $Z = 107x_1 + x_2 + 2x_3$

Subject to $14x_1 + x_2 - 6x_3 + 3x_4 = 7$

$16x_1 + x_2 - 6x_3 \leq 5$

$3x_1 - x_2 - x_3 \leq 0$

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

22. Determine an initial basic solution to the following TP by Least-Cost Method.

	P	Q	S	a_i
A	5	10	12	14
B	20	15	19	16
C	13	8	11	10
b_j	13	15	12	

23. A company has 4 machines on which to do 3 jobs. Each job can be assigned to one and only one machine. The cost of each job on each machine is given in the following table. Assign machines to jobs so as to minimize the total cost.

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

24. We have 6 jobs, each of which must go through the machines A and B in the order AB. Processing times in hours are given in the table below:

Job	I	II	III	IV	V	VI
Machine A	5	9	4	7	8	6
Machine B	7	4	8	3	9	5

Determine a sequence for the six jobs that will minimize the total elapsed time. Also compute the total elapsed time and idle time for both the machines.

25. A company has 5 jobs to be done using 5 machines. The following matrix shows the return in rupees of assigning $i^{th}(i = 1, 2, 3, 4, 5)$ machine to j^{th}job$(j = A, B, C, D, E)$.

	A	B	C	D	E
1	5	11	10	12	4
2	2	4	6	3	5
3	3	12	5	14	6
4	6	14	4	11	7
5	7	9	8	12	5

Assign the five jobs to the five machines so as to maximize the total expected profit.

26. Draw a network diagram

Activity	A	B	C	D	E	F	G
Predecessor Activity	----	----	----	A, B	A, B	C, D, E	C, D, E
Activity Duration	4	7	6	5	7	6	5

27. Solve by graphical method

Maximize $Z = 5x_1 + 3x_2$

Subject to $2x_1 + x_2 \leq 1$

$x_1 + 4x_2 \geq 6$

$x_1, x_2 \geq 0$

(6 × 4 = 24 Marks)

Part - IV

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

28. Solve the following LPP by Dual simplex method.

$Maximize\ Z = -2x_1 - x_2$

$Subject\ to\quad 3x_1 + x_2 \geq 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \geq 3$

$x_1, x_2 \geq 0$