Registration Number:

Date & Session:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU -27
BCA (DATA ANALYTICS)–6th SEMESTER
SEMESTER EXAMINATION: APRIL 2024
(Examination conducted in May /June 2024)
BCADA 6323: OPTIMIZATION TECHNIQUES

(For current batch students only)

Time: 2 Hours **Max Marks: 60**

This paper contains 4 printed pages and three parts. Graph Sheet will be provided.

PART- A

Answer all the FIVE questions. **[2 X 5 = 10]**

1. Write any four assumption of Linear programming model.
2. A furniture dealer deals in two items viz, tables and chairs. He has ₹ 10, 000 to invest and a space to store atmost 60 pieces. A table costs him ₹ 500 and a chair of ₹ 200. He can sell a table at a profit of ₹ 50 and a chair at a profit of ₹ 15. Assume that he can sell all the items that he buys. Formulate the problem as an LPP, so that he can maximize the profit.
3. Define degenerate and non-degenerate basic feasible solution of the transportation problem?
4. Why is the critical path important path of the project?
5. List the components of queuing system or process.

PART- B

Answer any FIVE questions out of SEVEN questions **[4 X 5 = 20]**

6. Solve the following LPP by graphical method.

$$Max\ Z = 4\,x_1 + x_2$$

Subject to

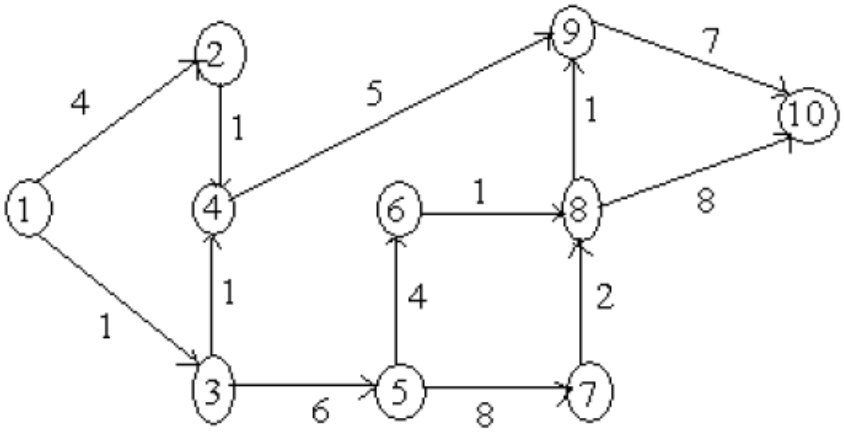
$$x_1 + x_2 \leq 50$$
$$3x_1 + x_2 \leq 90$$
$$x_1, x_2 \geq 0$$

7. Analyze the conditions for testing the optimality of an LPP.
8. A company has three production facilities S_1, S_2 and S_3 with production capacity of 7, 9 and 18 units (in 100s) per week of a product, respectively. These units are to be shipped to four warehouses D_1, D_2, D_3 and D_4 with requirement of 5, 6, 7 and 14 units (in 100s) per week, respectively.
   The transportation costs (in rupees) per unit between factories to warehouses are given in the table below:

	D_1	D_2	D_3	D_4	Supply (Availability)
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand (Requirement)	5	8	7	14	34

   Apply Least Cost method to find the initial solution of the above problem.

9. Analyze the criteria's for the extremum of a multivariate function with an example.
10. Demonstrate the idea for the Jacobian Method.
11. A television repairman finds that the time spent on his jobs has an exponential distribution with mean of 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets follows a Poisson distribution approximately with an average rate of 10 per 8-hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?
12. Analyze the network and calculate the critical path using head event and tail event.



PART- C

Answer any THREE questions out of FOUR questions **[10 X 3 = 30]**

13. Solve the following LPP by simplex method.

$$Max\ Z = 2\,x_1 + 4\,x_2$$

Subject to

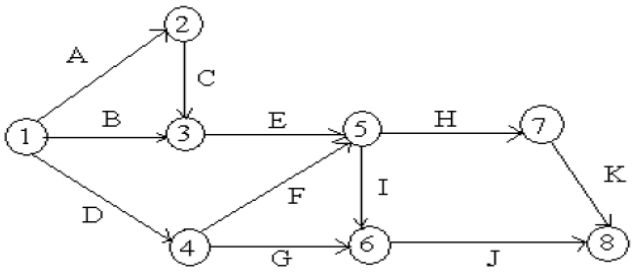
$$2x_1 + x_2 \leq 18$$
$$3x_1 + 2x_2 \geq 30$$
$$x_1 + 2x_2 = 26$$
$$x_1, x_2 \geq 0$$

14. To stimulate interest and provide an atmosphere for intellectual discussion, the faculty of mathematical sciences in an institute decides to hold special seminars on four contemporary topics – Statistics, Operations Research, Discrete Mathematics, Matrices. Each such seminar is to be held once a week. However, scheduling these seminars (one for each topic and not more than one seminar per day) has to be done carefully so that the number of students unable to attend is kept to a minimum. A careful study indicates that the number of students who cannot attend a particular seminar on a specific day is as follows:

Days	Statistics	Operations Research	Discrete Math	Matrices
Monday	50	40	60	20
Tuesday	40	30	40	30
Wednesday	60	20	30	20
Thursday	30	30	20	30
Friday	10	20	10	30

Find an optimal schedule for the seminars. Also find the number of students who will be missing at least one seminar.

15. For the network, find the earliest and latest expected time to each event and also critical path in the network.



Task:	A	B	C	D	E	F	G	H	I	J	K
Least time:	4	5	8	2	4	6	8	5	3	5	6
Greatest time:	8	10	12	7	10	15	16	9	7	11	13
Most likely time:	5	7	11	3	7	9	12	6	5	8	9

16. Assume that you have a printer that can print an average file in two minutes. Every two and a half minutes a user sends another file to the printer.
    (a) How long does it take before a user can get their output?
    (b) To speed things up you can buy another printer that is exactly the same as the one you have. How long will it take for a user to get their files printed if you had two identical printers?
    (c) Another solution is to replace the existing printer with one that print a file in an average of one minute. How long does it take for a user to get their output with the faster printer? [2+6+2]