B.E. COMPUTER SCIENCE AND ENGINEERING FOURTH YEAR SECOND SEMESTER EXAMINATION 2021

Subject: OPTIMIZATION TECHNIQUES AND OPERATIONS RESEARCH **Time:** 3 hours
Full marks:70

1. Describe different procedures for converting a constraint to un-constraint Non-linear programming with examples. (mention equity and inequity both constraints). What is the significance of necessary and sufficient conditions for Non-linear programming? 7+3

OR

Analyze the significance of relaxation and restriction for linear programming? 3+4+3
What is degeneracy? When does it occur? How do you resolve it efficiently?
Identify similarities and dissimilarities of Dual simplex and reverse simplex method.

2. Solve the following LPP problem using any of the simplex method. Write the algorithm first and then solve (Explain every steps clearly with formulas) . Here RL indicates last two digits of your roll no)' 15

$$Maximize\ Z = 30x_1 + 50x_2$$
$$s.t.\ x_1 + RL * x_2 \leq 4 * RL$$
$$5RLx_1 + 3x_2 \geq 8 * 20$$
$$x_1, x_2 \geq 0$$

3. Find the optimum integer solution to solve the following all Integer Programming Problem 15

$$Maximize\ Z = x_1 + 2x_2$$
$$s.t.\ 2x_2 \leq 7$$
$$x_1 + x_2 \leq 7$$
$$2x_1 \leq 11$$
$$x_1, x_2 \geq 0\ and\ x_1, x_2\ are\ integer$$

OR

Find the initial basic feasible solution using Vogel approximation method of the following transportation problem: 15

Warehouse

Factory	W1	W2	W3	W4	Factory Capacity
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Warehouse Requirement	5	8	7	14	34

Then solve it using the MODI method.

4 Solve the following non-linear programming problem using the langrage multiplier method. 10

$$Minimize\ Z = 3.6\ x_1 - 0.4{x_1}^2 + 1.6\ x_2 - 0.2{x_2}^2$$
$$s.t.\ 2x_1 + x_2 = 10$$
$$x_1, x_2 \geq 0$$

5. Subimal lives in Kolkata and plans to drive by car to Chennai to visit his friends. During his journey he plans to sleep overnight at his friend's house during the journey. He has friends at Cuttack(dist. 420 km.), Bhubaneswar(dist. 442 km.), Puri (dist. 497 km.) , Visakhapatnam (dist. 468 km. from Cuttack, 441 km. from Bhubaneswar, 443 km. from Puri), and Vijayawada (dist. 796 km. from Cuttack, 769 km. from Bhubaneswar, 770 km. from Puri), Chennai (dist. 790 km. from Visakhapatnam, 453 km. from Vijayawada). He cannot drive more than 800 km in a day. He takes rest accordingly to his friend house. During resting at Puri, Visakhapatnam and Vijayawada he will visit nearby shops and other places which need to be added with the distance. It is around 2* (last two digits your roll no) km. on an average. Ranjit wants to select a route which minimizes the distance driven. Which town should he visit on his journey? (solve using dynamic programming) 10

6.. Consider a single Server queuing system with Poisson input and exponential service times. Suppose the mean arrival rate is 3 calling units per hour, the expected service time is 0.26 - (last two digits your roll no * 0.005) and maximum permissible calling units in the system is two. Derive the steady state-probability distribution of the member calling units in the system, and then calculate the expected number in the system. 10