(c) Apply Walfe’s Method for solving the quadratic programming problem:

Maximize \( Z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2 \)

Subject to constraints:
\( x_1 + 2x_2 \leq 2 \)
and \( x_1, x_2 \geq 0 \).

5. Attempt any two of the following: \((10\times2=20)\)

(a) What is Queueing Theory? What information can be obtained by analysing a queueing system?

(b) An automatic vending machine at the airport dispenses a cup of coffee in 48 seconds. Customers arrive according to Poisson process with a mean rate of 25 per hour. Calculate:

(i) The average no. of people that will be waiting for service.

(ii) The average waiting time of the customer.

(iii) Average no. of customers in the system.

(c) Explain Exponential Distribution and Erlang Distribution.
these departments are 150 each. Product A requires 2 hours in department C and 3 hours in department D. Product B requires 3 hours in department C and 2 hours in department D. The production of products A and B cannot exceed 40 units each because of marketability constraints. Formulate the L.P. model and solve it by Simplex method.

(b) Use Big-M method to maximize:
\[ Z = 3x_1 - x_2 \]
subject to the constraints:
2\(x_1 + x_2 \geq 2\)
3\(x_1 + 3x_2 \leq 3\)
x_2 \leq 4
and x_1, x_2 \geq 0.

(c) Use dual simplex method to solve the following L.P. problem.
Minimize Z = 6x_1 + 7x_2 + 3x_3 + 5x_4
subject to constraints:
5\(x_1 + 6x_2 - 3x_3 + 4x_4 \geq 12\)
x_2 + 5x_3 - 6x_4 \geq 10
2\(x_1 + 5x_2 + x_3 + x_4 \geq 8\)
and x_1, x_2, x_3, x_4 \geq 0.

3. Attempt any two of the following: (10×2=20)
(a) Find the optimum integer solution to the following all integer linear programming problem:
Maximize Z = x_1 + 2x_2
subject to the constraints:
2\(x_2 \leq 7\)
x_1 + x_2 \leq 7
2\(x_1 \leq 11\)
x_1, x_2 \geq 0 and x_1, x_2 are integers.

(b) There are four machines and four operators. Operator 1 charges Rs. 6, 7, 7 and 8 on machines I, II, III and IV respectively. Operator 2 charges Rs. 7, 8, 9 and 7, Operator 3 charges Rs. 8, 6, 7 and 6 and Operator 4 charges Rs. 8, 7, 6 and 9 respectively. Assign one operator to one machine so that overall payment is minimum.

(c) Use Vogel’s Approximation Method to obtain an initial basic feasible solution of the transportation problem:

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Demand

4. Attempt any two of the following: (10×2=20)
(a) State the Bellman’s “Principle of optimality” and explain by an illustrative example how it can be used to solve a multistage decision problem.

(b) Use dynamic programming to solve the following L.P.P.:
Maximize Z = 3x_1 + 5x_2
subject to the constraints:
x_1 \leq 4
x_2 \leq 6
3\(x_1 + 2x_2 \leq 18\)
x_1, x_2 \geq 0.