BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS:M.Tech **SEMESTER: II**
BRANCH:ECE **SESSION: SP/22**

SUBJECT: EC558 MODERN OPTIMIZATION TECHNIQUES

TIME: 2H **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions of total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Draw the flowchart of the binary Genetic Algorithm? [3]

Q.1(b) Describe multi-objective and single-objective optimization problems. [3]

Q.1(c) Explain the concept of weighted sum method to find the solution of unconstrained multi-objective optimization problem. [5]

Q.2(a) Explain the concept of duality in LPP. [3]

Q.2(b) Write the dual of the following primal LPP problem [3]

$$\begin{aligned} \text{Maximize} \quad & Z = 8x + 6y \\ \text{Subject to} \quad & 4x + 2y \leq 600 \\ & 2x + 4y \leq 480 \\ & x,y \geq 0 \end{aligned}$$

Q.3. A man goes to market to purchase buttons. He needs at least 20 large buttons and 30 small buttons. The shopkeeper sells button in two forms (i) boxes and (ii) cards. A box contains 2 large and 5 small buttons and a card 10 large and 5 small buttons. Formulate this problem as LPP in which he should minimize the total cost if a box cost 10 paise and a card 25 paise only. Solve this problem by graphical method. [5]

Q.4(a) Explain the Lagrange multiplier method to find the solution to the two-variable optimization problem with equality constraints. [5]

Q.4(b) Write the name of two indirect methods to find solution of unconstrained multivariable nonlinear programming problem. [2]

Q.5(a) Write the names of indirect methods to find the solution of constrained multivariable nonlinear programing problem. [2]

Q.5(b) Write the different basis to classify the optimization problem. [4]

Q.5(c) Write the Gradient and Hessian matrix for the function [5]

$$f(x) = x^2{}_1 + 3x^2{}_2 + 4x^2{}_3 + 2x_1x_2 - 5x_2x_3$$

Also find the directional derivative of the function at (1, 1, 1) in the direction d = [1 2 3]

Q.6(a) What are the different techniques of the direct bracketing methods to find the optimal values of the unimodal function? [5]

Q.6(b) Minimize $f(x) = (100 - x)^2$ over the interval $60 \leq x \leq 150$ up to three stages using interval halving method. [5]

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