Code No: 56021 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, February/March - 2022
ENGINEERING OPTIMIZATION
(Aeronautical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) State the optimization problem. Classify and explain various types of optimization problems with examples.
b) State the necessary and sufficient conditions for the minimum of a function f (x). [7+8]

2. Find the maximum of the function $f(X)=2x_1+x_2+10$ subject to $g(x)=x_1+2x_2^2+3$ using the Lagrange multiplier method. Also find the effect of changing the right-hand side of the constraint on the optimum value of *f*. [15]

3.a) Write short notes on Fletcher Reeves method along with an example.
b) Find $Min\ Z=x^3-3x-5$. Take initial interval as [0, 1.2] and accuracy α = 10%. Solve it by Fibonacci method. [7+8]

4.a) Minimize $f(x_1, x_2)=x_1-x_2+2x_1^2+2x_1x_2+x_2^2$ from the starting point X_1= (0, 0) using Powell's method.
b) Why is Powell's method called a pattern search method? Explain. [10+5]

5.a) Minimize $f(x)=6x_1^2+4x_1x_2+3x_2^2$ subject to $h(x)=x_1+x_2-5=0$ using the augmented Lagrange multiplier (ALM) method.
b) What is the difference between the interior and extended interior penalty function methods? [10+5]

6. Minimize $f=x_1x_2^2x_3^{-1}+2\ x_1^{-1}x_2^{-3}x_4+10x_1x_3$
Subject to
$$3x_1x_3^{-1}x_4^2+4x_3^{-1}x_4^{-1}\geq 1$$
$$5x_1x_2\leq 1$$ [15]

7.a) State the characteristics of a constrained nonlinear programming problem. Explain them.
b) Explain interior penalty function method for a constrained nonlinear programming problem. [8+7]

8. An aircraft company uses rivets at an approximate customer rate of 2500 kg per year. Each unit costs Rs. 30 per kg. And the company personnel estimate that it costs Rs. 130 to place an order, and that the carrying cost of inventory is 10% per year.
a) How frequently should orders for rivets be placed? Also determine the optimum size of each order.
b) If the actual costs are Rs. 500 to place an order and 15% for carrying cost, the optimum policy would change. How much is the company losing per year because of imperfect cost information? [7+8]

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