

R09

Code No: 56021

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, December - 2018

ENGINEERING OPTIMIZATION

(Common to ME, AE)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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- 1.a) Classify the engineering optimization problems and give some examples. [8+7]  
b) Explain truss structure and ammonia structure. [8+7]
2. Determine the maximum and minimum values of the function  $f(x) = 12x^5 - 45x^4 + 40x^3 + 5$ . [15]
3. Optimize the following multi variable unconstrained function: [15]  
 $f(x_1, x_2, x_3) = x_1 + 2x_3 + x_2x_3 - x_1^2 - x_2^2 - x_3^2$
4. Classify different gradient methods and explain Newton-Raphson Method and steepest ascent method. [15]
5. Solve the problem by using quadratic programming: [15]  
Maximize  $Z = 4x_1 + 6x_2 - 2x_1^2 - 2x_2^2 - 2x_1x_2$   
Subject to  $x_1 + 2x_2 \leq 2$ ,  $x_1, x_2 \geq 0$
6. Solve the following unconstrained problem by using geometric programming: [15]  
Minimize  $Z = 7x_1x_2^{-1} + 3x_2x_3^{-1} + 5x_3x_2x_1^{-3} + x_1x_2x_3$
7. Consider the following linear programming model: [15]  
Minimize  $Z = 40x_1 + 50x_2$   
Subject to  $2x_1 + 3x_2 \geq 30$ ,  
 $x_1 + x_2 \geq 12$ ,  
 $2x_1 + x_2 \geq 20$ , and  $x_1, x_2 \geq 0$   
a) Use graphical method to solve this model  
b) How does the optimal solution change if the objective function is changed to  $Z = 40x_1 + 70x_2$  ?  
c) How does optimal solution change if the third function constraint is changed to  $2x_1 + x_2 \geq 150$  ? [5+5+5]
8. Solve the following linear programming problem using genetic algorithm. [15]  
Maximize  $f(x) = 12x^5 - 97x^4 + 28000x^3 - 345000x^2 + 180000x$   
Subject to  $0 \leq x \leq 31$

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