國立臺灣科技大學
九十三學年度博士班考試試題

系所組別：機械工程系甲二組
科　　目：最佳設計

總分100分

1. Explain the optimization algorithms based on the genetic search and gradient descent search in details and also discuss the advantages and disadvantages of these algorithms. (20%)

2. Discuss the golden section method step by step and also draw a diagram for estimating the maximum, minimum, or zero of a one-variable function using the golden section method. (20%)

3. Use the optimization method to solve : (20%)

$$\begin{aligned} &\text{Minimize} && f = c_1x_1+c_2x_2+\ldots\ldots+c_nx_n \\ &\text{Subject to} && a_{11}x_1+a_{12}x_2+\ldots\ldots+a_{1n}x_n=b_1 \\ & && a_{21}x_1+a_{22}x_2+\ldots\ldots+a_{2n}x_n=b_2 \\ & && \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ & && a_{m1}x_1+a_{m2}x_2+\ldots\ldots+a_{mn}x_n=b_m \end{aligned}$$

where $x_1, x_2 \ldots x_n \geq 0$
$b_1, b_2 \ldots b_m \geq 0$

4. Please answer the following questions: (20%)
   a) In the case of unconstrained optimization problem, how do we know that we have reached the optimum during the search process?
   b) In the case of constrained optimization problem, how do we know that we have reached the optimum during the search process?

5. Describe the concept of penalty function in the optimization approach and also briefly discuss exterior, interior, and augmented Lagrange multiplier methods. (20%)

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