

國立勤益科技大學九十八學年度研究所碩士班招生筆試試題卷

所別：電機工程系

組別：

科目：工程數學

准考證號碼：□□□□□□□□ (考生自填)

考生注意事項：

一、考試時間 100 分鐘。

二、

三、

試題一：〈20 分〉

Find the general solution of the second-order differential equation

$$x^2 y'' + 2xy' - 6y = 0$$

試題二：〈20 分〉

Use the Gram-Schmidt process to transform the given basis B for R^n into an orthonormal basis. Use the Euclidean inner product for R^n and use the vectors in the order in which they are given.

$$B = \{(4, -3, 0), (1, 2, 0), (0, 0, 4)\}$$

試題三：〈20 分〉

Solve the following differential equations by using the Laplace transform, where

$u_s(t)$ denotes a unit-step function.

$$\frac{dx_1(t)}{dt} = x_2(t)$$

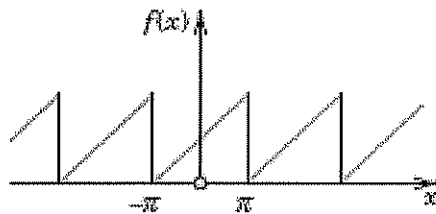
$$\frac{dx_2(t)}{dt} = -2x_1(t) - 3x_2(t) + u_s(t)$$

$$x_1(0) = 1, \quad x_2(0) = 0$$

試題四：〈20分〉

Find the Fourier series of the function

$$f(x) = x + \pi \quad \text{if} \quad -\pi < x < \pi \quad \text{and} \quad f(x + 2\pi) = f(x).$$



試題五：〈20分〉

Let a continuous vector field $\mathbf{F}(x,y,z)=xi+yj+2zk$. Compute $\nabla \cdot \mathbf{F}$, $\nabla \times \mathbf{F}$ and $\nabla \cdot (\nabla \times \mathbf{F})$.