

國立暨南國際大學九十二學年度碩士班研究生入學考試試題

第 1 節工程數學 適用:(地震所結構組 501 地震所大地組 511)

(本試題共 / 頁, 第 / 頁)

考生注意: 1. 依次序作答, 只要標明題號, 不必抄題。

2. 答案必須寫在答案卷上, 否則不予計分, 並限以藍黑色筆作答。

3. 試題隨卷繳回。(除請詳閱試場規則)

1. Solve the following nonhomogeneous differential equation: [15%]

$$x^2 \frac{d^2 y(x)}{dx^2} - 5x \frac{dy(x)}{dx} + 8y(x) = x^5 \cos x$$

2. Solve the following nonhomogeneous differential equation: [15%]

$$\frac{d^2 y(x)}{dx^2} + 8 \frac{dy(x)}{dx} + 16y(x) = x \cos(2x)$$

3. Use Laplace transform to solve the following equation [15%]

$$\frac{dy(t)}{dt} + \int_0^t y(x) dx = tH(t-2), \quad y(0) = 1$$

where $H(t)$ is the Heaviside function.

4. Evaluate the surface integral $\iint_S \mathbf{F} \cdot \mathbf{n} dS$ where $\mathbf{F} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ and S is the

surface of the sphere $x^2 + y^2 + z^2 = 4$ lying between the planes $z = 1$ and $z = 2$. [20%]

5. Evaluate the integral $\int_{-\infty}^{\infty} \frac{\cos x}{x^2 - 2x + 5} dx$ [15%]

6. Solve the problem of the vibrating rectangular membrane: [20%]

$$\frac{\partial^2 u}{\partial t^2} - \frac{\partial^2 u}{\partial x^2} - \frac{\partial^2 u}{\partial y^2} = 0, \text{ for } 0 < x < \pi, 0 < y < A, t > 0$$

$$u = 0, \text{ for } x = 0, x = \pi, y = 0, y = A$$

$$u(x, y, 0) = f(x, y),$$

$$\frac{\partial u}{\partial t}(x, y, 0) = g(x, y)$$