編號: 185,197,207

國立成功大學104學年度碩士班招生考試試題

系所組別:電機工程學系、電腦與通信工程研究所甲丁組、電機資訊學院-微電奈米聯招

考試科目:工程數學

考試日期:0211,節次:3

第/頁,共 /頁 請於答案卷(卡)作答,於本試題紙上作答者,不予計分。 ※ 考生請注意:本試題不可使用計算機。 1. (17%) Solve $\frac{\partial^2 z}{\partial t^2} = 4 \left(\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} \right)$ for $0 < x < 2\pi$, $0 < y < 2\pi$, t > 0 with following initial and boundary conditions. $z(x,0,t) = z(x,2\pi,t) = 0$ for $0 < x < 2\pi, t > 0$, $z(0, y, t) = z(2\pi, y, t) = 0$ for $0 < y < 2\pi, t > 0$, $z(x,y,0) = 0 \quad \text{for } 0 < x < 2\pi, 0 < y < 2\pi,$ $\frac{\partial z}{\partial t}(x, y, 0) = 1 \quad \text{for } 0 < x < 2\pi, 0 < y < 2\pi.$ 2. (15%) Consider Bessel function $J_{\nu}(x)$ of order $\nu \ge 0$ with j_n as its *n*-th zero. Prove that the functions $\sqrt{x} J_{\nu}(j_n x)$, for n = 1, 2, 3, ..., are orthogonal on [0,1] in the sense that $\int_0^1 x J_{\nu}(j_n x) J_{\nu}(j_m x) dx = 0 \quad \text{if } n \neq m.$ 3. (15%) Find a general solution of the following differential equation $y'' - 2y' + y = e^x sinx$ 4. (18%) Find the following initial value problem

- $y^{IV} + 3y^{''} 4y = 0$ y(0)=0, y'(0)=-20, y''(0)=0, y'''(0)=80
- 5. Evaluate the Cauchy principal value of
 - (a) $\int_{-\infty}^{\infty} \frac{1}{x^4 + 1} dx$ (10%) (b) $\int_{0}^{\infty} \frac{x \sin x}{x^2 + 9} dx$ (10%)
- 6. Use contour integration to evaluate $\int_0^\infty \frac{(\ln x)^2}{x^2+1} dx \quad (15\%)$