國立中央大學 106 學年度碩士班考試入學試題

所別: 光電科學與工程學系 碩士班 不分組(一般生)

共<u>2</u>頁 第<u>1</u>頁

科目: 工程數學

本科考試可使用計算器,廠牌、功能不拘

*請在答案卷 內·

須有計算過程

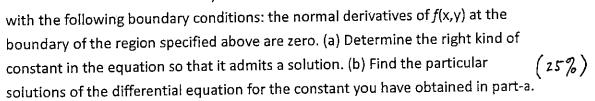
1.(a) Find a Fourier Sine-series which represents the following function:

$$f(x) = 1 + Sin(\pi x/2)$$
 $0 < x < 2$ in the range [0, 2].

- (b) Find the value of the sum of your series at x = 0 and x = 2. Are they equal to f(x) at x = 0 and x = 2, respectively? If not, why? (25%)
- 2. Consider the following differential equation

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) f(x, y) = (\text{constant}) f(x, y)$$

in the rectangular region: $0 \le x \le a$ $0 \le y \le b$



- 3. (a) The vector field $\vec{F} = \hat{x}(c_1z+3) + \hat{y}(y+c_2z) + \hat{z}(3z+2x)$ is said to be non-rotational. Find the constants c_1 and c_2 . Note that \hat{x} , \hat{y} , and \hat{z} are unit vectors in the x, y, and z directions. (5%)
 - (b) From the gradient of what scalar function can we obtain this vector field? (5%)
- 4. Find the solution for the differential equation $\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = \cos(t)$, which satisfies the initial condition y(0) = 1 and y'(0) = 0. We note that y' means $\frac{dy}{dt}$. (13%)

注:背面有試題

國立中央大學 106 學年度碩士班考試入學試題

所別: 光電科學與工程學系 碩士班 不分組(一般生)

共2頁 第2頁

科目: 工程數學

本科考試可使用計算器,廠牌、功能不拘

*請在答案卷 內作答

5. Find the eigenvalues and the eigenfunctions for the inverse matrix of matrix A,

where
$$\mathbf{A} = \begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$$
. (13%)

6. Find the Laplace Transform of $\sin \sqrt{t}$. Or, put in mathematical form, find

$$\mathcal{L}\{\sin\sqrt{t}\} = ? \qquad (14\%)$$