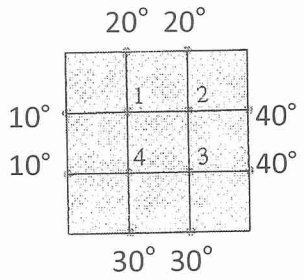
國立中央大學103學年度碩士班考試入學試題卷

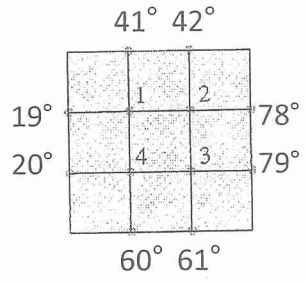
所別：電機工程學系碩士班 電波組(一般生)　科目：工程數學(不含複變)　共 1 頁 第 1 頁

本科考試禁用計算器　　＊請在試卷答案卷（卡）內作答

1. (30%) The following figures show a metal plate with two different sets of boundary temperatures. Let T_1, T_2, T_3, and T_4 denote the temperatures at the four interior nodes of the mesh in each case. And assume the interior temperature at a node is equal to the average of the four closest nodes—to the left, above, to the right, and below. Find (T_1, T_2, T_3, T_4) in (a) and (b), respectively.



(a)



(b)

2. (20%) Find a general solution for the following differential equation.

$$(D^2+2D+2I)y=e^{-x}/\cos^3 x$$

3. (25%) Using the **Laplace Transform** (and showing the details of your work), find the current i(t) in Fig1, assuming $i(0) = 0$, and

$$f(t)=v(t)=t \quad if\, 0<t<1 \text{ and } v(t+1)=v(t),$$

as shown in Fig 2 (where $k = p = 1$).

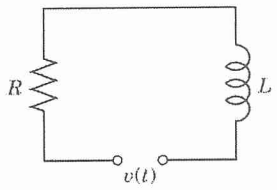


Fig1.

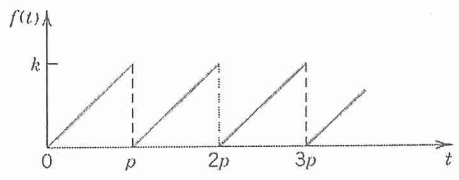


Fig2.

4. (25%) The following $x(t)$ shows a continuous-time periodic signal.

For $-0.4 \le t \le 1.6$, the waveform can be represented as $x(t)=e^{-2(t+0.4)}$ with periodic interval T = 2.

Please determine the coefficients of its Complex Fourier Series.