

國立中央大學103學年度碩士班考試入學試題卷

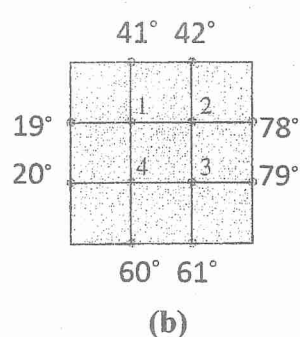
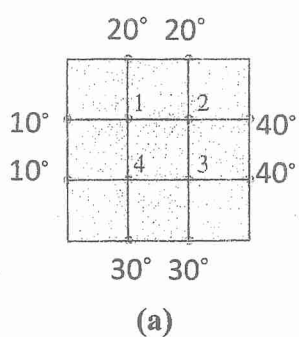
所別：電機工程學系碩士班 固態組(一般生) 科目：工程數學 共 2 頁 第 1 頁

電機工程學系碩士班 系統與生醫組(一般生)

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.



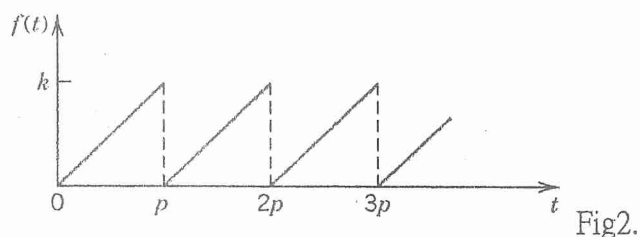
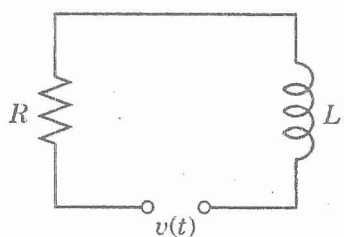
2. (10%) Find a general solution for the following differential equation.

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

3. (20%) Using the Laplace Transform (and showing the details of your work), find the current $i(t)$ in Fig1, assuming $i(0) = 0$, and

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

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



參考用

注意：背面有試題

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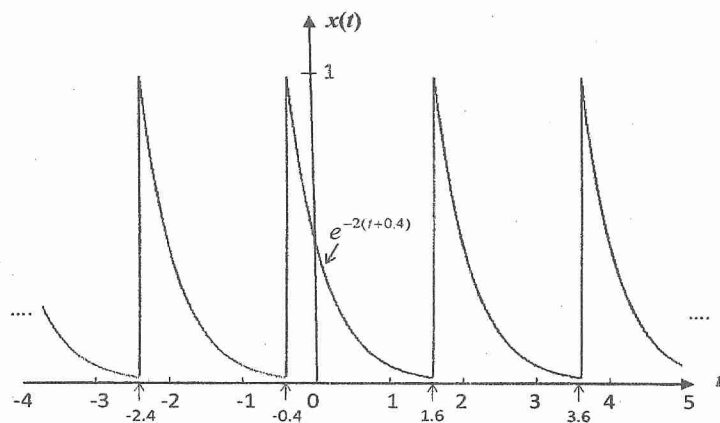
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4. (10%) The following $x(t)$ shows a continuous-time periodic signal.

For $-0.4 \leq t \leq 1.6$, 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.



5. (15%) Let $f(z) = (-i)^z$. Find $f'(z)$ and $f'(i)$. Use the principal branch of the logarithm in the evaluation.

6. (15%) Evaluate the integral $\oint_C \frac{e^{1/z}}{1+z} dz$, where C is the circle $|z| = 0.5$ oriented counterclockwise.

參考用

注意：背面有試題