

### 工程數學（丙組）試題

填准考證號碼

第一頁 共一頁

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#### 注意事項：

1. 本試題共 5 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

(20%) 1. Solve the nonhomogeneous equation

$$y'' - 2y' + y = x + 8e^x.$$

(20%) 2. Find the Laplace transform of the following function with period  $T = 2\pi/\omega$  :

$$\begin{aligned} v(t) &= V_m \sin \omega t & \text{when } 0 < t < \pi/\omega & \text{ and} \\ v(t) &= 0 & \text{when } \pi/\omega < t < 2\pi/\omega. \end{aligned}$$

(20%) 3. Show that if  $f(t)$  has the Fourier transform  $F(\omega)$  and  $g(t)$  has the Fourier transform  $G(\omega)$ , then the convolution of the two functions  $f(t) * g(t)$  has the Fourier transform  $F(\omega)G(\omega)$ .

(20%) 4. Integrate  $1/(z - a)^m$  ( $m$  is a positive integer) in the counterclockwise sense around any simple closed path  $C$  enclosing the point  $z = a$ .

(20%) 5. Find the eigenvalues and eigenfunctions of the Sturm-Liouville problem

$$y'' + \lambda y = 0, \quad y(0) = 0, \quad y(\pi) = 0.$$