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國立臺北科技大學

九十六學年度四年制二、三年級轉學生招生考試

系所組別：四技三年級電機工程系

第二節　專業科目（一）工程數學 試題

注意事項：

1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (20%) Solve the initial value problem of the differential equation
$x^2y'' - xy' - 2y = x^3 + 4\ln(x)$; $y(1) = 9$, $y'(1) = 7$ for $x > 0$.

2. (20%) Using Laplace transform, find $y(t)$ satisfying the given equation and conditions below.
$y'' + 4y = f(t)$; $y(0) = y'(0) = 1$, with $f(t) = \begin{cases} 0 & \text{for } 0 \le t < \pi \\ \cos(t) & \text{for } t \ge \pi \end{cases}$.

3. (20%) Find the complex Fourier series of the periodic function that is obtained by passing the voltage $v(t) = 10\sin(t)$ through a full-wave rectifier.

4. (20%) Find the torsion of the curve C: $\vec{\mathbf{F}}(t) = [\cos(t) + t\sin(t)]\vec{\mathbf{i}} + [\sin(t) - t\cos(t)]\vec{\mathbf{j}} + t^2\vec{\mathbf{k}}$ for $t > 0$.

5. (20%) To evaluate the determinant of $|\mathbf{AB}|$
if $\mathbf{A} = \begin{bmatrix} -5 & 0 & 15 & -3 \\ 0 & \pi & 993 & \sqrt{29} \\ 0 & 0 & -12 & 5 \\ 0 & 0 & 0 & 2 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} -3 & 1 & 8 & 0 \\ 2 & 1 & -1 & 0 \\ 4 & -5 & 2 & 6 \\ 11 & -3 & 1 & 7 \end{bmatrix}$.