

國立臺北科技大學
 九十五學年度學士班二、三年級轉學生招生考試
 四技三年級 化學工程與生物科技系
 專業科目（一）工程數學試題

填准考證號碼

--	--	--	--

第一頁 共一頁

注意事項：

1. 本試題共 7 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. Solve the differential equation (15%)

$$xy' + y - x^2y^4 = 0$$

2. Solve the non-homogeneous Cauchy-Euler equation (15%)

$$x^3y''' + x^2y'' - 2xy' + 2y = 2/x$$

3. A cone is given by $z = \sqrt{x^2 + y^2}$, determine the normal vector at the point $(3, 1, \sqrt{10})$ (10%).

4. Express the following function in a Fourier integral and determine what this integral converges to (15%).

$$f(x) = 1 \text{ for } -1 \leq x \leq 1$$

$$= 0 \text{ for } |x| > 1$$

5. What is the Laplace transform of the arc of the parabola $y = -t^2 + 3t - 2$ that lies in the first quadrant (15%).

6. Find the inverse of

$$\begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix} \quad (15\%)$$

7. Use the divergence theorem to evaluate

$$I = \iint_S x^3 dy dz + x^2 y dz dx + x^2 z dx dy$$

where S is the closed surface consisting of the cylinder $x^2 + y^2 = a^2$, $0 \leq z \leq b$, and the circular disks $z = 0$, and $z = b(x^2 + y^2 \leq a^2)$ (15%).