

九十八學年度四年制二、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

第二節 專業科目 (一) 工程數學 試題

第一頁 共一頁

注意事項：

1. 本試題共九題，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. (10%) Solve the differential equation

$$\frac{dy}{dx} = 2^{x-1}$$

2. (10%) Find the Laplace transform of the given function

$$f(t) = \pi + e^{t+\ln t}$$

3. (10%) What function has Laplace transform e^{-s}/s^2 ?

4. (10%) Find the product AB for the following matrices:

(5%) (a)

$$A = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}, \quad B = \begin{bmatrix} 5 & 0 & 4 \end{bmatrix}$$

(5%) (b)

$$A = \begin{bmatrix} 5 & 0 & 4 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}$$

5. (15%) Determine the matrix M such that $AMB = C$ when

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & 1 \\ 1 & 1 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 1 \\ 2 & 2 \\ 1 & 1 \end{bmatrix}.$$

6. (10%) Let $\mathbf{F}(x, y, z) = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$. Find $\text{div } \mathbf{F}$ and $\text{curl } \mathbf{F}$.

7. (10%) Evaluate $\iint_S (3x\mathbf{i} + 2y\mathbf{j}) \cdot d\mathbf{A}$, where S is the sphere $x^2 + y^2 + z^2 = 9$.

8. (10%) Compute the Fourier series for the function $f(x) = \cos^2 x$ on $(-\pi, \pi)$.

9. (15%) Solve the partial differential equation

$$\frac{\partial^2 g(u, v)}{\partial u \partial v} = 0$$