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淡江大學 96 學年度碩士班招生考試試題

系別：機械與機電工程學系　　　　科目：工　程　數　學

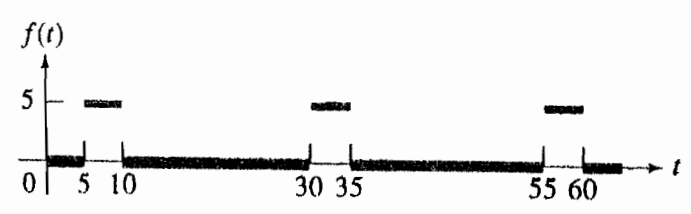1. (15%) Find the Laplace transform $\mathcal{L}[f]$, f has the graph of Figure 1.

Figure 1

2. (15%) Solve $2y^2 - 9xy + (3xy - 6x^2)y' = 0$.

3. (15%) Solve $x^2 y'' - 3xy' + 3y = 6x^4 e^{-3x}$.

4. (20%) Evaluate $\iint\limits_{\Sigma} f(x, y, z)d\sigma$ which is the surface integral of f over a smooth surface Σ. $f(x, y, z) = 1$, Σ is the part of the paraboloid $z = x^2 + y^2$ lying between the planes $z = 2$ and $z = 7$.

5. (15%) Evaluate $\int_{-\infty}^{\infty} \dfrac{x + 2}{(x^2 - 4)(x^2 + 4)}dx$.

6. (20%) Solve the partial differential equation

$$\frac{\partial^2 y}{\partial t^2} = \frac{\partial^2 y}{\partial x^2} \qquad (0 \le x \le 2,\ t > 0),$$

$$y(0, t) = 10,\ y(2, t) = 30 \qquad (t > 0),$$

$$y(x, 0) = 10x,\ \frac{\partial y}{\partial t}(x, 0) = 0 \qquad (0 \le x \le 2).$$