Math 202–Final Exam (Summer 05)   B. Shayya

- Please write your **section number** on your booklet.
- Please answer each problem on the **indicated page(s)** of the booklet. Any part of your answer not written on the indicated page(s) will not be graded.
- Unjustified answers will receive little or no credit.

Problem 1 (answer on page **1** of the booklet.)
(36 pts) Find the general solution of the ODE

$$y^{(4)} + 2y'' + y = 0$$

on the interval $(-\infty, \infty)$.

Problem 2 (answer on page **2** of the booklet.)
(36 pts) Use the Laplace transform to solve the IVP

$$\begin{cases} y'' + 4y' + 13y = \delta(t - \pi) \\ y(0) = 1, \quad y'(0) = 0. \end{cases}$$

Problem 3 (answer on page **3** of the booklet.)
(12 pts each) Find the following transforms.

(i) $L\left\{ \int_0^t \tau e^{5\tau} \sin(t - \tau) d\tau \right\}$ (ii) $L\left\{ (t - 2)u(t - 2) \right\}$ (iii) $L^{-1}\left\{ \dfrac{e^{-5s}}{(s - 1)^3} \right\}$

Problem 4 (answer on pages **4** and **5** of the booklet.)
(36 pts) Find two linearly independent series solutions of the equation

$$xy'' + 2(1 - x)y' + 2y = 0$$

about the regular singular point $x = 0$. (It is enough to find the first 4 terms of each series. **GRR**, **RRI**, and **RRII** must be clearly stated.)

Problem 5 (answer on page **6** of the booklet.)
(36 pts) Find the general solution of the system

$$X' = \begin{pmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 5 \end{pmatrix} X$$

on the interval $(-\infty, \infty)$.