

MATH 251
Summer 2003
Exam 2
July 24, 2003

ANSWERS:

1. (d); 2. (a); 3. i. F, ii. F, iii. T;

4. (a) $Y(t) = (A_2t^2 + A_1t + A_0) + t^2(B_1t + B_0)e^{-2t} + (C_1t + C_0) \cos 3t + (D_1t + D_0) \sin 3t$;

(b) $y(t) = C_1e^{-t} + C_2e^t - \frac{3}{2}te^{-t}$.

5. (a) $u'' + 4u' + 20u = 0$, $u(0) = 0$, $u'(0) = 2$; (b) $u(t) = \frac{1}{2}e^{-2t} \sin 4t$; (c) $\mu = 4$ rad/sec.

6. $f(t) = (1 - u_2(t))t^2 + (e^{3t} - t)u_2(t)$; $F(s) = \frac{2}{s^3} - \frac{e^{-2s}}{s^3} (2 + 5s + 6s^2) + \frac{e^{6-2s}}{s-3}$.

7. $y(t) = e^{-t} \cos 2t + \frac{1}{2}e^{-t} \sin 2t + \frac{3}{2}u_{2\pi}(t)e^{-t+2\pi} \sin 2t$.

8. (a) $\bar{X}(t) = C_1 \begin{pmatrix} 1 \\ -1 \end{pmatrix} e^{-3t} + C_2 \begin{pmatrix} 5 \\ 2 \end{pmatrix} e^{4t}$; (b) $\alpha = 5$.

9. $\bar{X}(t) = \begin{pmatrix} 5e^t \sin 3t - 2e^t \cos 3t \\ 5e^t \cos 3t + 2e^t \sin 3t \end{pmatrix}$.