

MATH 251
Summer 2002
Exam 2
July 17, 2002

ANSWERS:

1. (a); 2. (d); 3. (a); 4.(c);

5. $Y(t) = (A_2t^2 + A_1t + A_0)e^{3t} + Bte^{-t} + (D_1t + D_0)e^{2t} \cos 2t + (E_1t + E_0)e^{2t} \sin 2t$.

6. (a) $u'' + 4u' + 16u = 0, u(0) = 1, u'(0) = 0$; (b) $e^{-2t} \cos 2\sqrt{3}t + \frac{1}{\sqrt{3}}e^{-2t} \sin 2\sqrt{3}t$; (c) $\mu = 2\sqrt{3}$ rad/sec;

(d) $\omega = \sqrt{\frac{k}{m}} = 4$ rad/sec.

7. $f(t) = (1 - u_3(t))(t + 1) + u_3(t)(t^2 + e^t) = (t + 1) + u_3(t)[t^2 - t - 1 + e^t]$; $F(s) = \frac{1}{s^2} + \frac{1}{s} + e^{-3s} \left(\frac{2}{s^3} + \frac{5}{s^2} + \frac{5}{s} + \frac{e^3}{s-1} \right)$.

8. $y(t) = e^{2t} - 2te^{2t} + u_4(t) \cdot 2(t-4)e^{2(t-4)}$.

9. $\bar{X}(t) = 2 \begin{pmatrix} 1 \\ 1 \end{pmatrix} e^{5t} + \begin{pmatrix} -2 \\ 1 \end{pmatrix} e^{-t} = \begin{pmatrix} 2e^{5t} - 2e^{-t} \\ 2e^{5t} + e^{-t} \end{pmatrix}$.