MA 341-007 Test 2 Review Questions

S. Schecter

March 13, 2011

1. Homogeneous 2nd order linear equations with constant coefficients: Sec. 4.2 problems 6 (5 in 5th edition), 16; sec. 4.3, problems 14, 24.

2. Undetermined coefficients: Sec. 4.4 problems 18 and 32, Sec. 4.5 problems 18 and 28.

3. Variation of parameters: Sec. 4.6 problem 14.

4. Mass-spring systems: Sec. 4.9 problem 2 (1 in 5th edition).

5. Definition of Laplace transform: Sec. 7.2 problem 4.

6. Laplace transforms from tables: Sec. 7.3 problems 6 and 10.

7. Inverse Laplace transforms: Sec. 7.4 problems 24 and 26.

8. Solving initial value problems: Sec. 7.5 problem 10.

9. Transforms of discontinuous functions: Sec. 7.6 problem 32.

10. Transforms of delta functions: Sec. 7.8 problem 18.

Answers:

1. 4.2 problem 6: $c_1 e^{-4t} + c_2 t e^{-4t}$

2. 4.2 problem 16: $\frac{4}{3} e^t - \frac{1}{3} e^{3t}$

3. 4.3 problem 14: $c_1 e^t \cos 5t + c_2 e^t \sin 5t$

4. 4.3 problem 24: $\frac{1}{3} \sin 3t + \cos 3t$

5. 4.4 problem 18: $y_p = -2t \cos 2t$

6. 4.4 problem 32: $t(At^6 + Bt^5 + Ct^4 + Dt^3 + Et^2 + Ft + G)e^{-3t}$

7. 4.5 problem 18: $c_1 e^{3t} + c_2 e^{-t} - t^2 + \frac{4t}{3} + \frac{1}{9}$

8. 4.5 problem 28: $\frac{e^{-4t}}{60} + \frac{1}{12} - \frac{e^t}{10} - \frac{e^{2t}}{6} + \frac{7e^{3t}}{6}$

9. 4.6 problem 14: $c_1 \cos \theta + c_2 \sin \theta + \sin \theta \tan \theta - \frac{1}{2} \sec \theta$

10. 4.9 problem 2: $y = \frac{\sqrt{2}}{2} \sin\left(4t - \frac{\pi}{4}\right)$, amplitude $= \frac{\sqrt{2}}{2}$, period $= \frac{\pi}{2}$, frequency $= \frac{2}{\pi}$, passes through equilibrium at $t = \frac{\pi}{16}$ seconds.

11. 7.2 problem 4: $\frac{1}{(s-3)^2}$, $s > 3$.

12. 7.3 problem 6: $\frac{2}{(s+2)^2+4} + \frac{2}{(s-3)^3}$

13. 7.3 problem 10: $\frac{(s-2)^2 - 25}{((s-2)^2 + 25)^2}$

14. 7.4 problem 24: $5e^t + 2e^{2t} \cos 3t - 5e^{2t} \sin 3t$

15. 7.4 problem 26: $1 - \frac{3}{2}t^2 + 6e^{2t}$

16. 7.5 problem 10: $-t - e^{-2t} + 2te^{-2t} + e^{2t}$

17. 7.6 problem 32: $\cos t - \sin 2t - (2 \sin t)u(t - 2\pi) + (\sin 2t)u(t - 2\pi)$

18. 7.8 problem 18: $\frac{4}{3} e^{2t} - \frac{1}{2} e^t - \frac{5}{6} e^{-t} + \left(e^{2(t-1)} + e^{-(t-1)}\right) u(t - 1)$