Final Exam Online Section Answer Form
April 29, 2024

$$R(\tau) = \frac{1}{2\pi} \int_{-\infty}^{\infty} S(\omega) e^{j\omega\tau}\, d\omega \leftrightarrow S(\omega) = \int_{-\infty}^{\infty} R(\tau) e^{-j\omega\tau}\, d\tau$$

$$\delta(\tau) \leftrightarrow 1 \qquad\qquad 1 \leftrightarrow 2\pi\delta(\omega)$$

$$e^{j\beta\tau} \leftrightarrow 2\pi\delta(\omega - \beta) \qquad \cos\beta\tau \leftrightarrow \pi\delta(\omega - \beta) + \pi\delta(\omega + \beta)$$

$$e^{-\alpha|\tau|} \leftrightarrow \frac{2\alpha}{\alpha^2 + \omega^2} \qquad e^{-\alpha\tau^2} \leftrightarrow \sqrt{\frac{\pi}{\alpha}}\, e^{-\omega^2/4\alpha}$$

$$e^{-\alpha|\tau|}\cos\beta\tau \leftrightarrow \frac{\alpha}{\alpha^2 + (\omega - \beta)^2} + \frac{\alpha}{\alpha^2 + (\omega + \beta)^2}$$

$$2e^{-\alpha\tau^2}\cos\beta\tau \leftrightarrow \sqrt{\frac{\pi}{\alpha}}\,[e^{-(\omega-\beta)^2/4\alpha} + e^{-(\omega+\beta)^2/4\alpha}]$$

$$\begin{cases} 1 - \dfrac{|\tau|}{T} & |\tau| < T \\ 0 & |\tau| > T \end{cases} \leftrightarrow \frac{4\sin^2(\omega T/2)}{T\omega^2}$$

$$\frac{\sin\sigma\tau}{\pi\tau} \leftrightarrow \begin{cases} 1 & |\omega| < \sigma \\ 0 & |\omega| > \sigma \end{cases}$$

1–10	
11	
12	
13	
Total	

Name: _____

ID #: _____

Directions:

1. **Print** your name and student number on the cover page.
2. Exam is closed book, closed notes, and no calculators.
3. Clearly designate all answers asked for (arrows, underline, box, etc.)

Problems 1–10 are multiple choice problems worth 5 points each. For each problem, write the lettercorresponding to the best answer next to the problem number. Space is provided to work out your solution for each of these problems. Please show your work! If your final grade is near a borderline, the quality of your written solutions could significantly impact your final grade.

1. Answer:

2. Answer:

3. Answer:

4. Answer:

5. Answer:

6. Answer:

7. Answer:

8. Answer:

9. Answer:

10. Answer:

11. Problems 11 is made up of 8 True/False questions, worth 2 points each. Fill in your answers T (true) or F (false) below, corresponding to the statements A–H in problem 11 on the exam.

A. ____

B. ____

C. ____

D. ____

E. ____

F. ____

G. ____

H. ____

Problems 12 and 13 are "work out" problems for which partial credit will be awarded for correctly reasoned work. It is important that you coherently present your thinking in the solution of these problems if you wish to receive partial credit (or full credit for that matter.) Please work problems 12 and 13 of the exam in the designated space below.

12. Problem 12 Solution:

(Problem 12 Solution Continued)

(Problem 12 Solution Continued)

13. Problem 13 Solution:

(Problem 13 Solution Continued)

(Problem 13 Solution Continued)