ECE-205 Practice Quiz 5

1) The integral $\int_{-t+2}^{\infty} \delta(\lambda+5)d\lambda$ is equal to

a) $u(t)$ b) $u(t+5)$ c) $u(t-7)$ d) $u(-t+2)$ e) none of these

2) The integral $\int_{-\infty}^{t-3} \delta(\lambda-2)d\lambda$ is equal to

a) $u(t)$ b) $u(t-3)$ c) $u(t-2)$ d) $u(t+5)$ e) $u(t-5)$ f) none of these

3) The integral $\int_{-\infty}^{t} e^{-\lambda}\delta(\lambda-2)d\lambda$ is equal to

a) $e^{-2}u(t-2)$ b) $e^{-2}u(t)$ c) $e^{-t}u(t)$ d) $e^{-t}u(t-2)$ e) $e^{2}u(t-2)$ f) none of these

4) The function $x(t)=e^{t-1}\delta(t-2)$ can be simplified as

a) $x(t)=e^{1}$ b) $x(t)=e^{1}\delta(t-2)$ c) $x(t)=e^{1}u(t-2)$ d) none of these

5) The integral $\int_{-\infty}^{t} u(\lambda-1)\delta(\lambda+2)d\lambda$ can be simplified as

a) $u(t+2)$ b) $u(t-1)$ c) $u(t)$ d) none of these

6) The integral $\int_{2}^{t} \delta(\lambda-1)d\lambda$ is equal to

a) 0 b) $u(t)$ c) $-u(1-t)$ d) $u(t-2)$ e) none of these

7) The integral $\int_{-5}^{5} u(1-\lambda)u(\lambda+1)d\lambda$ is equal to a) 0 b) 1 c) 2 d) 10 e) none of these

8) The integral $\int_{-3}^{t} u(\lambda-1)d\lambda$ is equal to a) 0 b) $t+3$ c) $(t+3)u(t+3)$ d) $t-1$ e) $(t-1)u(t-1)$

9) The **impulse response** for the LTI system $y(t)=\frac{1}{2}[x(t)-x(t-1)]$ is

a) $h(t)=\frac{1}{2}[u(t)-u(t-1)]$ b) $h(t)=\frac{1}{2}[\delta(t)-\delta(t-1)]$ c) neither of these

10) The **impulse response** for the LTI system $y(t)=\int_{-\infty}^{t+1} e^{-(t-\lambda)}x(\lambda)d\lambda$ is

a) $h(t)=e^{-t}u(t)$ b) $h(t)=e^{-t}u(t+1)$ c) $h(t)=e^{-t}\delta(t)$ d) none of these

11) The **impulse response** for the LTI system $y(t)=2x(t)+\int_{-\infty}^{t-2} e^{-(t-\lambda)}x(\lambda+3)d\lambda$ is

a) $h(t)=2u(t)+e^{-(t+3)}u(t+1)$ b) $h(t)=2\delta(t)+e^{-(t+3)}u(t+1)$

c) $h(t)=2\delta(t)+e^{-(t+3)}u(t)$ d) $h(t)=2\delta(t)+e^{-(t+3)}u(t-2)$

e) $h(t)=2\delta(t)+e^{-(t+3)}u(t+3)$ f) none of these

12) The **impulse response** for the LTI system $\dot{y}(t)+y(t)=x(t-1)$ is

a) $h(t)=e^{t}u(t)$ b) $h(t)=e^{-t}u(t)$ c) $h(t)=e^{-(t-1)}u(t)$

d) $h(t)=e^{-(t-1)}u(t-1)$ e) $h(t)=e^{(t-1)}u(t-1)$ f) none of these

13) The **impulse response** for the LTI system $\dot{y}(t)-2y(t)=3x(t+1)$ is

a) $h(t)=3e^{2(t+1)}u(t+1)$ b) $h(t)=3e^{-2(t+1)}u(t+1)$ c) $h(t)=3e^{-2(t+1)}u(t-1)$

d) $h(t)=3e^{-2(t+1)}u(t)$ e) $h(t)=3e^{2(t+1)}u(t)$ f) none of these

14) The integral $h(t)=\int_{-\infty}^{t+1} e^{-(t-\lambda)}\delta(\lambda+3)d\lambda$ can be simplified as

a) $e^{-(t+3)}u(t)$ b) $e^{-(t+3)}u(t+1)$ c) $e^{-(t+3)}u(t+3)$ d) $e^{-(t+3)}u(t+4)$

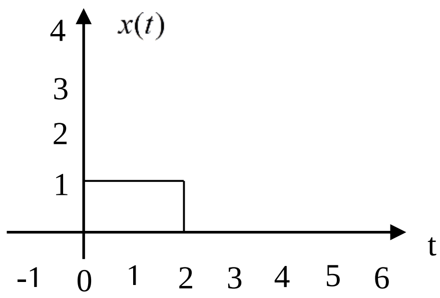
15) The integral $h(t)=\int_{-\infty}^{t-3} e^{-(t-\lambda)}\delta(\lambda-1)d\lambda$ can be simplified as

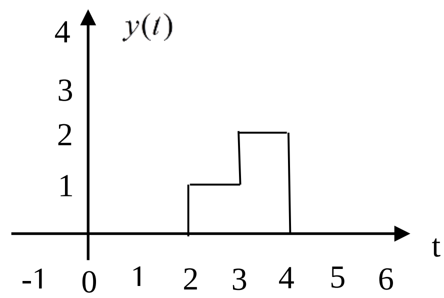
a) $e^{-(t-1)}u(t)$ b) $e^{-(t-1)}u(t-1)$ c) $e^{-(t-1)}u(t-3)$ d) $e^{-(t-1)}u(t-4)$

16) The integral $h(t)=\int_{-t+2}^{5} e^{-(t-\lambda)}\delta(\lambda-3)d\lambda$ can be simplified as

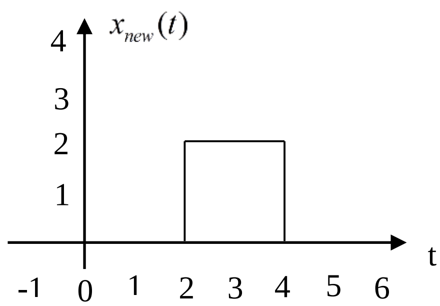
a) $e^{-(t-3)}u(t)$ b) $e^{-(t-3)}u(t+1)$ c) $e^{-(t-3)}u(t-3)$ d) $e^{-(t-3)}u(2-t)$

17) Assume we know a system is a linear time invariant (LTI) system. We also know the following input $x(t)$ – output $y(t)$ pair:



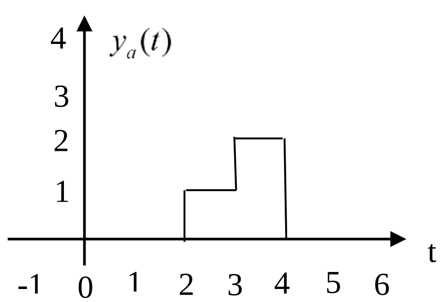


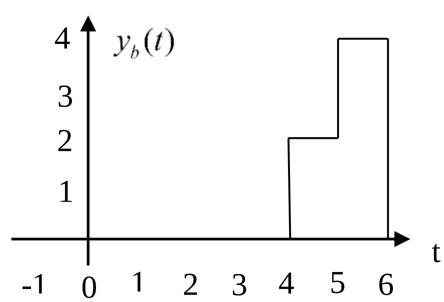
If the input to the system is now $x_{new}(t)$

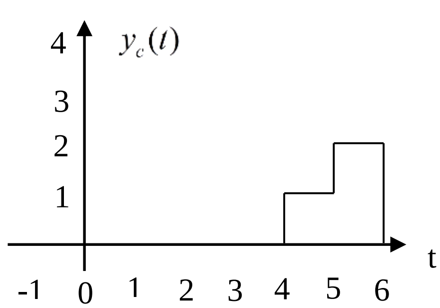


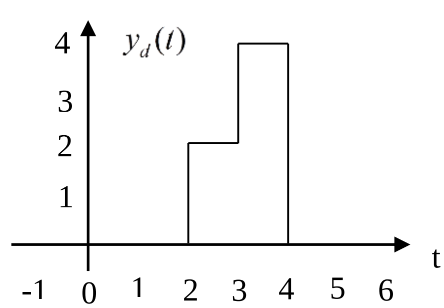
Which of the following best represents the output of the system?

a) $y_a(t)$ b) $y_b(t)$ c) $y_c(t)$ d) $y_d(t)$

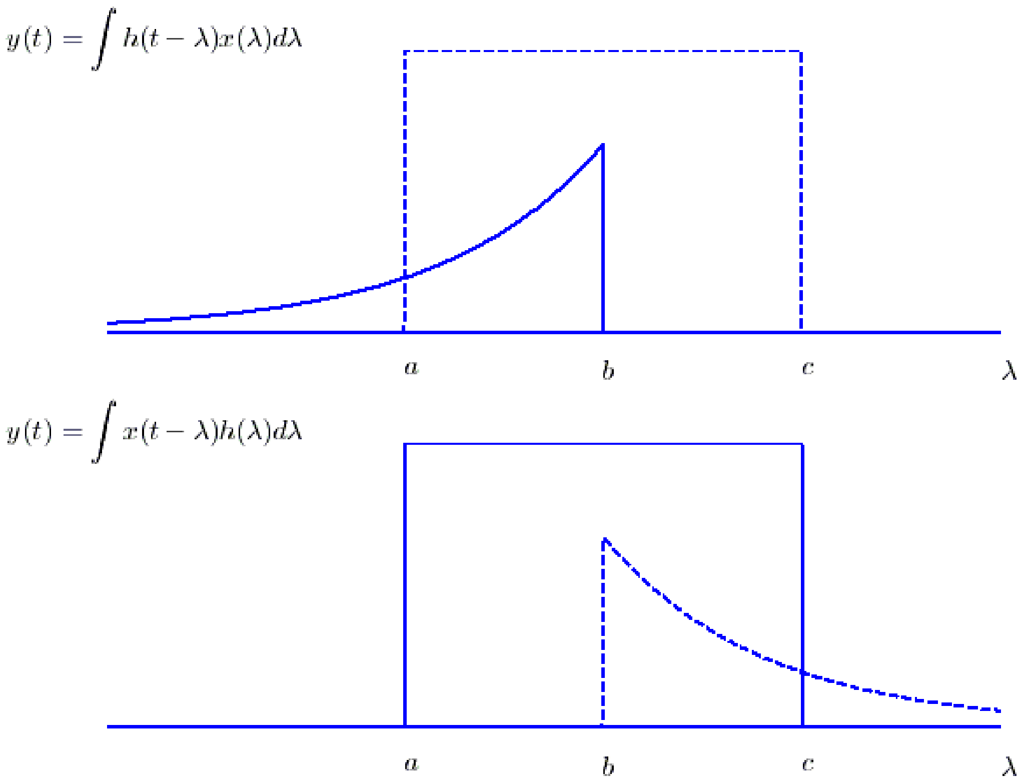








For problems **18-23**, assume we are going to convolve the impulse response $h(t) = 2e^{-t/0.8}u(t)$ with input $x(t) = 3[u(t+1) - u(t-1)]$.



For problems **18-20**, assume we perform the convolution using the form $y(t) = \int h(t-\lambda)x(\lambda)d\lambda$, depicted in the top panel in the above figure.

18) The parameter *a* is equal to a) 0 b) 1 c) -1 d) t e) λ f) none of these

19) The parameter *b* is equal to a) 0 b) 1 c) -1 d) t e) λ f) none of these

20) The parameter *c* is equal to a) 0 b) 1 c) -1 d) t e) λ f) none of these

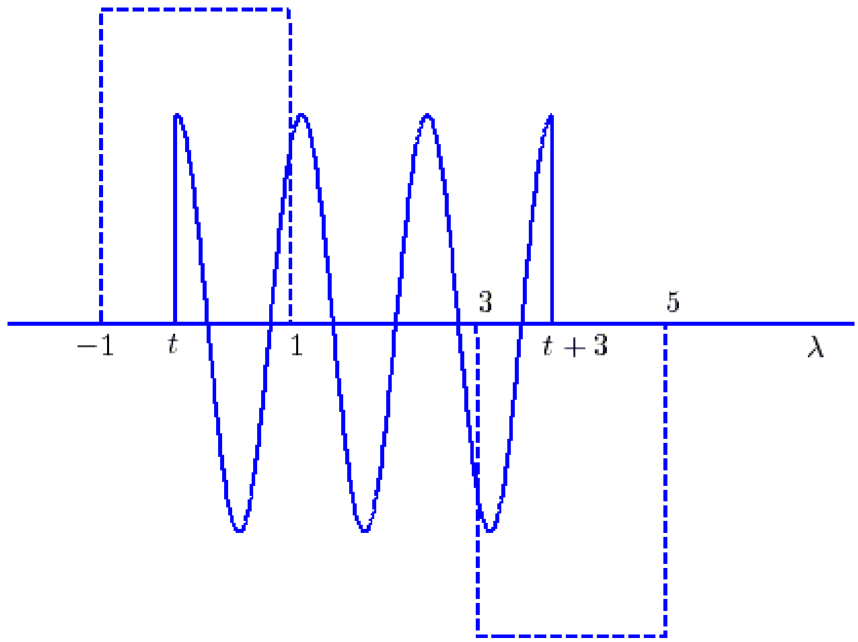
For problems **21-23**, assume we perform the convolution using the form $y(t) = \int h(\lambda)x(t-\lambda)d\lambda$, depicted in the bottom panel in the above figure.

21) The parameter *a* is equal to a) $t-1$ b) $t+1$ c) -1 d) 1 e) none of these

22) The parameter *b* is equal to a) $t-1$ b) $t+1$ c) -1 d) 1 e) none of these

23) The parameter *c* is equal to a) $t-1$ b) $t+1$ c) -1 d) 1 e) none of these

For problems **24-16**, assume we are convolving two functions, and at some point we have the configuration



shown below:

The output at this time can be written as the sum of two integrals,

$$y(t)=\int_a^b x(\lambda)h(t-\lambda)d\lambda+\int_c^d x(\lambda)h(t-\lambda)d\lambda \backslash$$

24) The value of the parameter a is a) -1 b) 1 c) 3 d) 5 e) t f) $t+3$

25) The value of the parameter b is a) -1 b) 1 c) 3 d) 5 e) t f) $t+3$

26) The value of the parameter c is a) -1 b) 1 c) 3 d) 5 e) t f) $t+3$

27) The value of the parameter d is a) -1 b) 1 c) 3 d) 5 e) t f) $t+3$

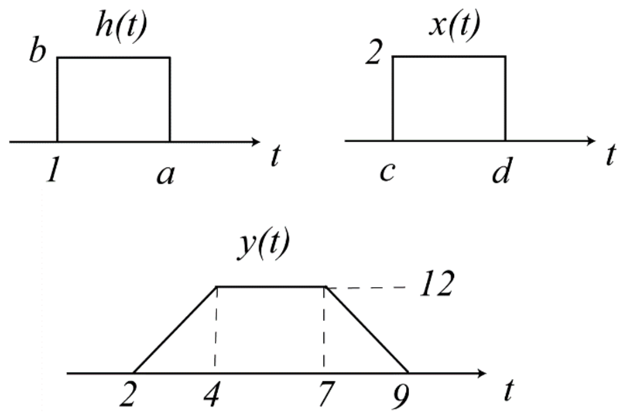
28) This sketch is valid for

a) $-1<t<1$ b) $3<t<5$ c) $0<t<2$ d) $0<t<1$ e) none of these

29) Is this a causal system? a) yes b) no c) it is not possible to tell

30) An LTI systems has impulse response, input, and output as shown below. Determine numerical values for the parameters *a*, *b*, *c*, and *d*. *Note that the diagram is not to scale!*

Assume a-1 < d-c or h(t) is narrower than x(t).



Answers: 1-c, 2-e, 3-a, 4-b, 5-d, 6-c, 7-c, 8-e, 9-b, 10-b, 11-b, 12-d, 13-a, 14-d, 15-d, 16-b ,17-b, 18-c, 19-d, 20-b, 21-a, 22-e, 23-b, 24-e, 25-b, 26-c, 27-f, 28-d, 29-b, 30 (a=3, b=3, c=1, d=6)