Unit 3 - Week 1

Assignment 1

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-02-12, 23:59 IST.

1) A function $u(t)$ is said to be L_2 ,if *1 point*

- It is Lebesgue measurable function and $\int_{-\infty}^{\infty} |u(t)|dt < \infty$
- It is Lebesgue measurable function and $\int_{-\infty}^{\infty} |u(t)|^2 dt < \infty$
- It is Lebesgue measurable function and $\int_{-\infty}^{\infty} u(t)dt < \infty$
- It is Lebesgue measurable function and $\int_{-\infty}^{\infty} u^2(t)dt < \infty$

No, the answer is incorrect.
Score: 0
Accepted Answers:
It is Lebesgue measurable function and $\int_{-\infty}^{\infty} |u(t)|^2 dt < \infty$

2) Considering $\{u(t) : [-T/2, T/2] \to \mathbb{R}\}$ be an L_2 function, then Fourier series coefficient, $u(k) = \frac{1}{T}\int_{-T/2}^{T/2} u(t) e^{-\frac{2\pi jkt}{T}} dt, \forall\ k \in \mathbb{Z}$ is *1 point*

- Lebesgue measurable function
- Lebesgue measurable function and L_1
- L_1
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
Lebesgue measurable function and L_1

3) Identify the orthogonal functions below *1 point*

- $sinc(t)$ and $sinc(t-1)$
- $e^{j2\pi kt/T} rect\left(\frac{t}{T}\right)$ and $e^{j2\pi mt/T} rect\left(\frac{t}{T}\right)$, $k \neq m$
- $\cos(2\pi t)$ and $\sin(2\pi t)$, $t = 3$
- All of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of the above

4) Inner Product of two real vectors $\langle v, u\rangle = \int_{-\infty}^{\infty} u(t)\, \overline{v(t)} dt$ is defined if *1 point*

- Both u and v are Lebesgue measurable functions
- $\int_{-\infty}^{\infty} |u(t)v(t)|^2 dt < \infty$
- $\int_{-\infty}^{\infty} |v(t)|^2 dt \neq 0,\ \ v = 0$
- Both u and v are Lebesgue measurable functions and $\int_{-\infty}^{\infty} |u(t)v(t)| dt < \infty$

No, the answer is incorrect.
Score: 0
Accepted Answers:
Both u and v are Lebesgue measurable functions and $\int_{-\infty}^{\infty} |u(t)v(t)| dt < \infty$

5) Let v and u be arbitrary vectors with $u \neq 0$ in a real or complex inner product space. Then $v_{|\beta u}$ is given as *1 point*

- $\left(\frac{\langle v,u\rangle}{\|u\|^2}\right)\beta u$
- $\left(\frac{\langle v,\beta u\rangle}{\|u\|^2}\right)\beta u$
- $\left(\frac{\langle v,\beta u\rangle}{\|\beta u\|^2}\right)\beta u$
- $\left(\frac{\langle v,u\rangle}{\|\beta u\|^2}\right)\beta u$

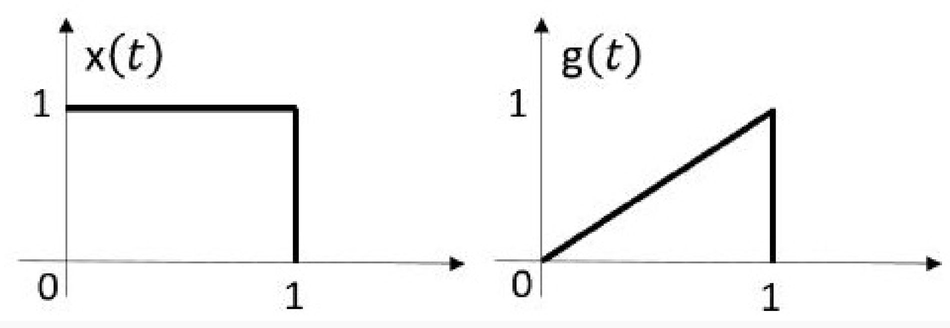
No, the answer is incorrect.
Score: 0
Accepted Answers:
$\left(\frac{\langle v,\beta u\rangle}{\|\beta u\|^2}\right)\beta u$

6) For a bandlimited additive white Gaussian noise channel if the input power is limited to 2 W, bandwidth is limited to 4 MHz and noise power per unit bandwidth is 1 μW/Hz then the capacity (in bits per second) is *2 points*

- 2.3×10^6
- 2.3×10^4
- 3.2×10^6
- 3.2×10^4

No, the answer is incorrect.
Score: 0
Accepted Answers:
2.3×10^6

7) $x(t)$ and $g(t)$ are shown below in the figures. If $g(t) \approx cx(t)$, what is the value of c for minimum error in approximation in [0,1] and also find the energy of the error signal *2 points*



- 1.5, 1/4
- 0.5, 1/12
- 1.5, 1/12
- 0.5, 1/4

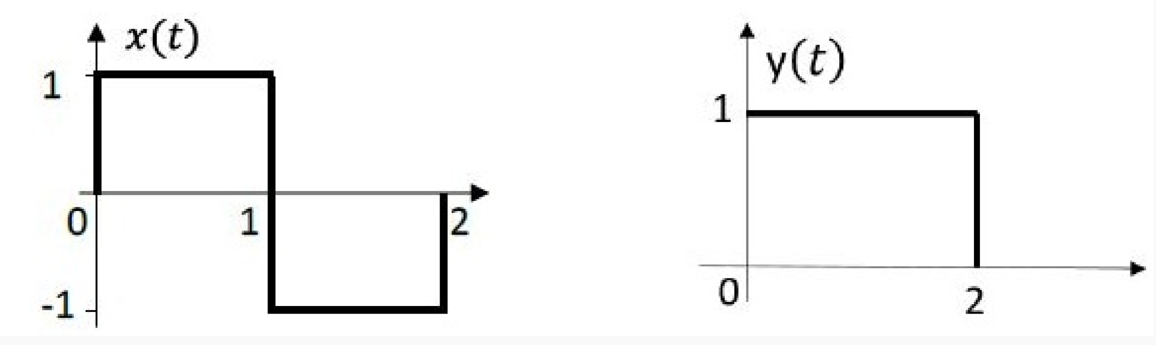
No, the answer is incorrect.
Score: 0
Accepted Answers:
0.5, 1/12

8) In the above question, If $x(t) \approx cg(t)$, find the optimum value of c for minimum error in approximation in [0,1] and also find the energy of the error signal *2 points*

- 1.5, 1/4
- 0.5, 1/12
- 1.5, 1/12
- 0.5, 1/4

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.5, 1/4

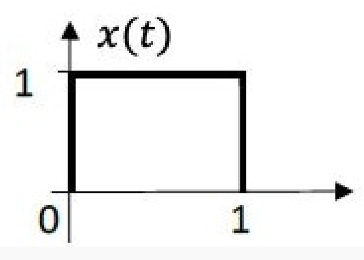
9) The angle between the two signals $x(t)$ and $y(t)$ is *2 points*



- 30°
- 60°
- 45°
- 90°

No, the answer is incorrect.
Score: 0
Accepted Answers:
90°

10) $x(t)$ is shown below in the figure. If $x(t) = \sum_{n=0}^{\infty} 2c_n\, x_n(t)$, $x_n(t) = e^{-jn2\pi t} I_{[0,1]}(t)$ and $I_{[0,1]}(t) = \begin{cases} 1 & 0 < t < 1 \\ 0 & Otherwise \end{cases}$ then c_1 is *2 points*



- $\frac{e^{j2\pi}-1}{j4\pi}$
- $\frac{e^{j2\pi}}{j4\pi}$
- $\frac{1-e^{-j2\pi}}{j4\pi}$
- $\frac{-e^{-j2\pi}}{j4\pi}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{e^{j2\pi}-1}{j4\pi}$