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State	Finished
Completed on	Saturday, 12 February 2022, 8:06 PM
Time taken	35 mins 12 secs
Marks	5.00/16.00
Grade	**3.13** out of 10.00 (**31**%)

Question 1

Incorrect

Mark 0.00 out of 1.00

A discrete FS representation of a signal $x(t)$ with period N is written as $x[n] = \sum_{k=0}^{N-1} a_k e^{j(2kn\pi/N)}$. A discrete time periodic signal with $N = 3$ has the non-zero FS coeffecients as $a_{-3} = 2, a_4 = 1$. The signal is:

Select one:

- a. $2 + 2e^{\left(j\frac{2\pi}{6}n\right)} cos\left(\frac{2\pi}{6}n\right)$
- b. $1 + 2e^{\left(j\frac{2\pi}{3}n\right)} cos\left(\frac{2\pi}{6}n\right)$
- c. $2 + 2e^{-\left(j\frac{2\pi}{6}n\right)} cos\left(\frac{2\pi}{6}n\right)$ ✗
- d. $1 + 2e^{\left(j\frac{2\pi}{6}n\right)} cos\left(\frac{2\pi}{6}n\right)$

Your answer is incorrect.

The correct answer is: $1 + 2e^{\left(j\frac{2\pi}{6}n\right)} cos\left(\frac{2\pi}{6}n\right)$

Question **2**

Incorrect

Mark 0.00 out of 1.00

The FS coefficients of a time domain signal $x(t)$ is $a_k = -\left(\frac{1}{3}\right)^{|k|}$. The fundamental frequency of the signal is $\omega_0 = 1$. The signal is:

Select one:

a. $\frac{5}{4+3sint}$

b. $\frac{5}{4+3cost}$ ✗

c. $\frac{4}{5+3sint}$

d. $\frac{4}{5+3cost}$

Your answer is incorrect.

The correct answer is: $\frac{4}{5+3sint}$

Question 3

Incorrect

Mark 0.00 out of 1.00

Let x(t) be a periodic signal whose Fourier series coefficients are $a_k = \begin{cases} 2, & k = 0 \\ j\left(\frac{1}{2}\right)^{|k|}, & \text{otherwise} \end{cases}$.

Answer the below questions:

a) Is $x(t)$ real?

b) Is $x(t)$ even?

c) Is $dx(t)/dt$ even?

Yes-Y, No-N

Select one:

- a. NYY
- b. NYN
- c. YYY
- d. YYN ✗
- e. NNN

Your answer is incorrect.

The correct answer is: NYN

Question 4

Correct

Mark 1.00 out of 1.00

Which of the following **cannot** be the Fourier Series expansion of a periodic signal?

Select one:

a. $x(t) = \cos(t) + 0.5$

b. $x(t) = 2\cos(0.5\pi t) + \sin(1.5\pi t)$

c. $x(t) = 2\cos(\pi t) + 7\cos(t)$ ✓

d. $x(t) = 2\cos(t) + 3\cos(3t)$

Your answer is correct.

The correct answer is: $x(t) = 2\cos(\pi t) + 7\cos(t)$

Question 5

Correct

Mark 1.00 out of 1.00

Fourier series of the periodic function (period 2π) defined by

$$f(x) = \begin{cases} 0 & -\pi \leq x < 0 \\ x & 0 < x \leq \pi \end{cases}$$ is

$$\frac{\pi}{4} + \sum_{n=1}^{\infty} \left[\frac{1}{n^2\pi}[cos(n\pi) - 1]cos(nx) - \frac{1}{n}cos(n\pi)sin(nx)\right]$$

The sum of the series $1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \ldots$ is

Select one:

a. $\frac{\pi}{8}$

b. $\frac{\pi}{2}$

c. $\frac{\pi^2}{8}$ ✓

d. $\frac{\pi^2}{4}$

Your answer is correct.

The correct answer is: $\frac{\pi^2}{8}$

Question 6

Incorrect

Mark 0.00 out of 1.00

The Fourier series representation of an impulse train denoted by

$$s(t) = \sum_{n=-\infty}^{\infty} \delta(t - nT_o)$$

is given by

Select one:

- a. $\frac{1}{T_o} \sum_{n=-\infty}^{\infty} e^{-\frac{j2\pi nt}{T_o}}$
- b. $\frac{1}{T_o} \sum_{n=-\infty}^{\infty} e^{\frac{j2\pi nt}{T_o}}$
- c. $\frac{1}{T_o} \sum_{n=-\infty}^{\infty} e^{\frac{j\pi nt}{T_o}}$
- d. $\frac{1}{T_o} \sum_{n=-\infty}^{\infty} e^{-\frac{j\pi nt}{T_o}}$

✗

Your answer is incorrect.

The correct answer is: $\frac{1}{T_o} \sum_{n=-\infty}^{\infty} e^{\frac{j2\pi nt}{T_o}}$

Question 7

Incorrect

Mark 0.00 out of 1.00

A continuous time signal with period T is given as

$$W_1 = \begin{cases} +1 & 0 < t < T/2 \\ -1 & T/2 < t < T \end{cases}$$

The magnitude of the n^{th} Fourier series coefficient of W_1 for $n \geq 1$, n odd is proportional to

Select one:

- a. $|n^{-1}|$
- b. $|n^{-4}|$
- c. $|n^{-3}|$
- d. $|n^{-2}|$

✗

Your answer is incorrect.

The correct answer is: $|n^{-1}|$

Question **8**

Incorrect

Mark 0.00 out of 1.00

A signal $x(t)$ is given by

$$x(t) = \begin{cases} 1, & \frac{-T}{4} < t \leq \frac{3T}{4} \\ -1, & \frac{3T}{4} < t \leq \frac{7T}{4} \\ -x(t+T) & \end{cases}$$

Which among the following gives the fundamental Fourier term of $x(t)$?

Select one:

- a. $\frac{\pi}{4} cos\left(\frac{\pi t}{2T} + \frac{\pi}{4}\right)$
- b. $\frac{\pi}{4} sin\left(\frac{\pi t}{2T} + \frac{\pi}{4}\right)$
- c. $\frac{4}{\pi} sin\left(\frac{\pi t}{T} - \frac{\pi}{4}\right)$ ✗
- d. $\frac{4}{\pi} cos\left(\frac{\pi t}{T} - \frac{\pi}{4}\right)$

Your answer is incorrect.

The correct answer is: $\frac{4}{\pi} cos\left(\frac{\pi t}{T} - \frac{\pi}{4}\right)$

Question 9

Incorrect

Mark 0.00 out of 1.00

Let $x(t)$ be a periodic signal with time period T. Given $y(t) = x(t - t_0) + x(t + t_0)$ and Fourier series coefficient of $y(t)$ is B_k. If $B_k = 0$ for all odd values of k then t_0 can be equal to

Select one:

- a. 2T
- b. $\frac{T}{4}$
- c. $\frac{T}{8}$
- d. $\frac{T}{2}$

✗

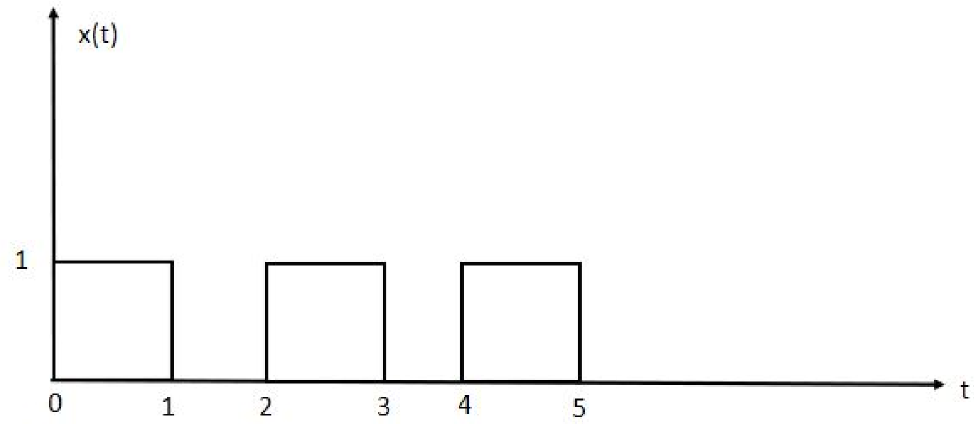
Your answer is incorrect.

The correct answer is: $\frac{T}{4}$

Question 10

Incorrect

Mark 0.00 out of 1.00



The power of the signal $x(t)$ upto second harmonic

Select one:

- a. 0.525 W
- b. 0.252 W
- c. 0.452 W
- d. 0.125 W

Your answer is incorrect.

The correct answer is: 0.452 W

Question **11**

Incorrect

Mark 0.00 out of 1.00

The Fourier Series coefficients of a periodic signal $x(t)$ expressed as

$x(t) = \sum_{k=-\infty}^{\infty} a_k e^{j2\pi kt/T}$ are given by

$a_{-2} = 2 - j1; a_{-1} = 0.5 + j0.2; a_0 = j2;$

$a_1 = 0.5 - j0.2; a_2 = 2 + j1;$ and $a_k = 0;$ for $|k| > 2.$ Which of the following is true ?

Select one:

- a. $x(t)$ has finite energy because only finitely many coefficients are zero
- b. The imaginary part of $x(t)$ is constant
- c. $x(t)$ has zero average value because it is periodic.
- d. The real part of $x(t)$ is even

✗

Your answer is incorrect.

The correct answer is: The imaginary part of $x(t)$ is constant

Question **12**

Incorrect

Mark 0.00 out of 1.00

A continuous time periodic signal $x(t)$ is real and even with a fundamental period of 6. The average value of $x(t)$ is 1. The FS coefficients are $a_k = \begin{cases} \frac{k}{2}, & 1 \le k \le 3 \\ 0, & k > 3 \end{cases}$. The average power of the signal $x(t)$ is:

Answer: 1 ✗

The correct answer is: 8

Question 13

Incorrect

Mark 0.00 out of 1.00

A continuous-time periodic signal $x(t)$ is real valued and has a fundamental period $T = 4$. The non-zero Fourier series coefficients for $x(t)$ are specified as: $a_1 = a^*_{-1} = 2j, a_5 = a_{-5} = 4$

$x(t)$ can be expressed as: $x(t) = Acos(\omega_1 t + \phi_1) + Bcos(\omega_2 t + \phi_2)$.

Find the value of $\frac{1}{2\pi} AB(\phi_1 + \phi_2)$.

Answer: 2

The correct answer is: 8

Question **14**

Correct

Mark 1.00 out of 1.00

Let $x(t)$ be a continuous time periodic signal with fundamental period $T = 1$ seconds. Let $\{a_k\}$ be the complex Fourier series coefficients of $x(t)$, where k is integer valued. Which of the following statement(s) is/are correct

Select one or more:

- [ ] a. The complex Fourier series coefficients of $x(3t)$ are $\{3a_k\}$, where k is integer valued
- [x] b. The complex Fourier series coefficients of $x(3t)$ are $\{a_k\}$, where k is integer valued ✓
- [x] c. The fundamental angular frequency of $x(3t)$ is 6π rad/s ✓
- [ ] d. The fundamental angular frequency of $x(3t)$ is 2π rad/s

Your answer is correct.

The correct answers are: The complex Fourier series coefficients of $x(3t)$ are $\{a_k\}$, where k is integer valued

, The fundamental angular frequency of $x(3t)$ is 6π rad/s

Question 15

Correct

Mark 1.00 out of 1.00

The Fourier series of a real periodic function has only

Select one or more:

- [ ] a. Sine terms if it is even
- [x] b. Cosine terms if it is even ✓
- [x] c. Sine terms if it is odd ✓
- [ ] d. Cosine terms if it is odd

Your answer is correct.

The correct answers are: Cosine terms if it is even, Sine terms if it is odd

Question 16

Correct

Mark 1.00 out of 1.00

1. Let $g : [0, \infty) \to [0, \infty)$ be a function defined by $g(x) = x - [x]$, where $[x]$ represents the integer part of x). (That is, it is the largest integer which is less than or equal to x. The value of the constant term in the Fourier series expansion of $g(x)$ is

Answer: 0.5 ✓

The correct answer is: 0.5 $^{+}/_{-}$ 0 (1 significant figures)