Class test 2

Test duration is for 75 minutes and 10 minutes extra for submission. Answer all. Write the answer as instructed
in the question. After the examination submit rough copy to signalsystemspkd@gmail.com, give roll number
 as the file name.

$\cdots$

Points: ██/40

1. A signal x(t) is given by the following equation. choose the most correct answer for its Fourier transform X(jw)
   (2/2 Points)

   $x\,(t)\;=\;\sum_{n=-\infty}^{+\infty} delta\,(t-nT)\,,\;\;represent\;a\;periodic\;train\;of\;delta\,functions$

   ○ $X\,(jw)\,=\,1$

   ○ $X\,(jw)\,=\,\infty$

   ○ $\sum_{n=-\infty}^{+\infty} \cos(w_0 n),\;\; w_0\,=\,\frac{2\pi}{T}$

   ◉ $X\,(jw)\,=\,w_0\,\sum_{n=-\infty}^{+\infty} delta\,(w-w_0 n)\,,\;\; w_0\,=\,\frac{2\pi}{T}$ ✓

2. A periodic signal is given by x(t) = 1- (4/T).t , 0<t<T/2 and x(t) = (4/T).t - 3, T/2<t<T and
   have 0-th, 1st, 2nd and 3rd Fourier series coefficients a0, a1,a2 and a3 respectively.
    Choose the most correct option
   (4/4 Points)

   ○

$a0 = 0,\ a1 = 0.202,\ a2 = 0,\ a3 = 0.81$

$a0 = 0.202,\ a1 = 0.81,\ a2 = 0,\ a3 = 0$

$a0 = 0,\ a1 = 0.81,\ a2 = 0,\ a3 = 0.09$ ✓

✗

3. h[n] and x[n] is given by the following equation. y[n] is the output of convolution of h[n] and x[n].
Find y[14], value of y[n] at n=14. Convolution property of DTFT may be used to compute y[14].
delta[n] in the equation is the digital delta function. Give the answer rounded up to two decimal place
(0/4 Points)

$$h\,[n] = delta\,[n] \ -\ \frac{\sin\left(\frac{\pi n}{8}\right)}{\pi n},\quad x\,[n] = \cos[\pi n] + \sin\left[\frac{\pi n}{7} + \frac{1}{2}\right];$$

0.92

Correct answers: 0.479,0.48,.48

4. Name *

[████████]

5. A periodic signal x(t) is given by the following equation. Find the 0-th Fourier series coefficient a0.
Write your answer rounded to two decimal places.
(4/4 Points)

$$x\,(t) = t^2,\quad -\pi < t < \pi \ and\ x\,(t + 2\pi) = x\,(t)\ \ i.\,e.\ period\ of\ x\,(t)\ is\ 2\pi$$

3.29   ✓

6. An LTI system is given by the following difference equation. Its impulse response is given by h[n].
Find the value of h[n] at n=1. Write your answer rounded up to two decimal places.
(4/4 Points)

$$y[n] - \frac{1}{2}y[n-1] = x[n] - \frac{1}{4}x[n-1]$$

0.25   ✓

7. A signal x(t) is given by the following equation has first four Fourier coefficients starting 0th coefficient as a0, a1, a2 and a3. Choose the most correct option.
(4/4 Points)

$$x(t) = 1 + 2\sin\left(\frac{7\pi}{3}t\right) - 3\cos\left(\frac{7\pi}{3}t\right) + \sin(7\pi t) + \cos\left(\frac{28\pi}{3}t\right)$$

○ $a0 = \frac{1}{2}, a1 = 1, a3 = -\frac{j}{2}, a3 = -\left(\frac{3}{2} + j1\right)$

◉ $a0 = 1, a1 = -\left(\frac{3}{2} + j1\right), a2 = -\frac{j}{2}, a3 = \frac{1}{2}$ ✓

○ $a0 = 1, a1 = -\left(\frac{3}{2} + j1\right), a2 = -\frac{j}{2}, a3 = 0$

✗

8. A system is given by a difference equation as given below. Determine whether the system is
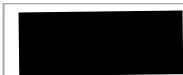 stable or unstable, choose the most correct option
(0/2 Points)

$$y[n] - \frac{11}{6}y[n-1] - \frac{1}{2}y[n-2] + \frac{1}{3}y[n-3] = x[n] + 2x[n-2]$$

◉ stable

○ unstable   ✓

9. Roll Number *

███████

✗

10. A signal x(t) is given by the following equation. Calculate the absolute value of the a3, fourth
Fourier series coefficient. Write your answer rounded to two decimal places.
(0/4 Points)

$x(t) = -1, \ -1 < t < 0; \ x(t) = 1, \ 0 < t < 1 \ and \ x(t+2) = x(t) \ . \ Find \ |a_3|$

0.11

Correct answers: $0.212, 0.21$

11. A signal x[n] is given by the following equation, choose the most correct answer.
(2/2 Points)

$x[n] = \cos(\sqrt{2}\,\pi n)$

○ Both discrete time Fourier series and discrete time Fourier transform exists for x[n]

◉ only discrete time Fourier transform exists for x[n]   ✓

○ only discrete time Fourier series exists for x[n]

12. An impulse response h[n] is given by the following equation. To check stability one has to evaluate
the sum S given as follows. Find S. DTFT summation rule may be used. Write the answer rounded to two decimal places.
(4/4 Points)

$h[n] = \left\{ n^2\left(-\frac{1}{2}\right)^n + 2\left(\frac{1}{4}\right)^n \right\} u[n]; \ S = \sum_{n=-\infty}^{+\infty} |h[n]|$

8.67   ✓

13. An LTI system has an impulse response h(t) and corresponding output y(t) given by the following equations. Also the equation of x(t) is given. Find the value of the constant K in x(t).
(4/4 Points)

$$h\left(t\right) \;=\; e^{-2t}u\left(t\right),\; y\left(t\right) \;=\; \left\{e^{-2t} - e^{-3t}\right\}\, u\left(t\right),\; x\left(t\right) \;=\; e^{Kt}u\left(t\right)$$

−3 ✓

14. A signal x(t) is given by the following equation. Find x(jw) at w=2. Write the answer rounded up to
two decimal places
(2/2 Points)

$$x\left(t\right) = e^{-2|t|},\; find\; X\left(jw\right)\; at\; w = 2$$

0.5 ✓