Class Test- Signal and Systems

answer all, use math mode to answer. You need to press submit after completion. The photos of solved problems in your notebook need to be submitted separately to an assignment in MS Teams as a single file.

Points: [redacted]/30

1. Determine the period of the signal given by x(t) below.
(2/2 Points)

$$x(t) = \sin\left(\frac{2\pi}{5}t\right)\cos\left(\frac{4\pi}{3}t\right)$$

15 ✓

2. Roll Number *

[redacted]

3. . Impulse response of a linear time invariant system is given by h[n] ={1,2,1,-1} for n=-1,0,1,2 respectively and h[n]=0 elsewhere.. The input signal fed to the system is given by x[n]={1,2,2,1} for n=0,1,2,3 and
x[n] =0 elsewhere. Find y[n]. Write y[n] in the same format of x[n]
(2/4 Points)

$h[n] = \{1, 2, 1, -1\}\ for\ n = -1, 0, 1, 2\ respectively;\ \ x[n] = \{1, 2, 2, 1\} for\ n = 0, 1, 2, 3$

$y[n] = \{1, 4, 7, 6, -1, -1\}\ for\ n = -1, 0, 1, 2, 3, 4, 5$

Correct answers:

$y[n] = \{1, 4, 7, 6, 2, -1, -1\}\ for\ n = \{-1, 0, 1, 2, 3, 4, 5\},$

$y[n] = \{1, 4, 7, 6, 2, -1, -1\}\ for\ n = -1, 0, 1, 2, 3, 4, 5\ respectively,$

$y[n] = \{1, 4, 7, 6, 2, -1, -1\}\ for\ n = -1, 0, 1, 2, 3, 4, 5,$

$y[n] = \{1, 4, 7, 6, 2, -1, -1\}\ for\ n = -1, 0, 1, 2, 3, 4, 5$

4. An accumulator given by the equation below is excited by an input x[n]=n u[n]. If y[-1] =0 then determine the value y[1000].
(4/4 Points)

$y[n] = \sum_{k=-\infty}^{n} x[k]$

500500 ✓

✗

5. Determine whether the impulse response is causal or non-causal, with memory or without memory, stable or unstable. Write four answers separated by comma.
(0.5/2 Points)

$h(t) = -3\, e^{2t}\, u(t)$

causal, with memory, stable

Correct answers: *causal, with memory, unstable*

6. Determine the value of the expression given below.
(2/2 Points)

$\int_0^3 e^{(t-2)} \delta(2t-4)\, dt$

0.5 ✓

✗

7. A discrete time system is given by the following equation. Determine whether the system is linear or non-linear, time invariant or variant, causal or non-causal, stable or unstable. Write answers separated by comma.
(2/2 Points)

$y(n) = x[n]$, $for\ x[n] \geq 0\ and\ y[n] = 0,\ for\ x[n] < 0$

non – linear, time invariant, causal, stable

Correct answers:

Nonlinear, Time invariant, Causal, Stable ,Nonlinear Time invariant Causal Stable,
Non – linear, time invariant, causal, stable

8. Name and Roll Number *

[redacted]

9. Unit step signal u[n] is given by the following equation. Find the energy and power of u[n]. Write the answer as energy=.. and power=..
(2/2 Points)

$u[n] = 1\ for\ n \geq 0\ and\ u[n] = 0\ for\ n < 0$

$energy = \infty\ and\ power = 0.5$ ✓

10. The input-output pairs for a (not LTI) LTV system are observed as follows. Find the impulse response h[n].
For an input x1[n] ={-1,2,1} for n= -1,0,1 output y1[n] ={-1,2,-1,0,1} for n= -1,0,1,2,3 and
for an input x2[n] ={1,-1,-1} for n= -1,0,1 output y2[n] = {-1, 1, 0, 2} for n= -1,0,1,2
Write the answer h[n] in the format of x1[n].
(4/4 Points)

$h[n] = \{-2, 3-1, 2, 1\}\ for\ n = -1, 0, 1, 2, 3$

Correct answers:

$h[n] = \{-2, 3, -1, 2, 1\}\ for\ n = -1, 0, 1, 2, 3, h[n] = \{-2, 3, -1, 2, 1\},$
$h[n] = \{-2, 3, -1, 2, 1\}\ for\ n = \{-1, 0, 1, 2, 3)$

11. A discrete time signal x[n] is given by the following equation. Determine odd and even part of the signal.
Write the answer in the format of x[n] as o[n] = {,,,} for n=.....and e[n]={,,,} for n=.....
(4/4 Points)

$x[n] = \{4, 2, 1\}\ for\ n = 0, 1, 2;\ x[n] = 0\ for\ n > 2;\ x[n] = 0\ for\ n < 0$

$o[n] = \{-0.5, -1, 0, 1, 0.5\}\ for\ n = -2, -1, 0, 1, 2\ and\ e[n] = \{0.5, 1, 4, 1, 0.5\}\ for\ n = -2$

Correct answers:

$o[n] = \{-0.5, -1, 0, 1, 0.5\}\ for\ n = -2, -1, 0, 1, 2\ and\ e[n] = \{0.5, 1, 4, 1, 0.5\}\ for\ n = -2, -1, 0, 1, 2,$
$o[n] = \left\{-\frac{1}{2}, -1, 0, 1, \frac{1}{2}\right\}\ for\ n = -2, -1, 0, 1, 2\ and\ e[n] = \left\{\frac{1}{2}, 1, 4, 1, \frac{1}{2}\right\}\ for\ n = -2, -1, 0, 1, 2,$
$e[n] = \{0.5, 1, 4, 1, 0.5\}\ for\ n = -2, -1, 0, 1, 2\ and\ o[n] = \{-0.5, -1, 0, 1, 0.5\}\ for\ n = -2, -1, 0, 1, 2$

12. Determine the range of values of a and b for which the linear time invariant system , having impulse
response h[n], is stable
(4/4 Points)

$h[n] = a^n,\ n \geq 0\ and\ h[n] = b^n,\ n < 0$

$(-1 < a < 1)\ ,\ ((b < -1)\ or\ (b > 1))$

Correct answers:

$|a| < 1\ and\ |b| > 1, |a| < 1,\ |b| > 1, |a| < 1\ |b| > 1, -1 < a < 1\ ,\ b > 1\ and\ b < -1,$
$-1 < a < 1,\ b > 1\ or\ b < -1, -1 < a < 1\ and\ -1 > b > 1$