PRINT YOUR NAME HERE:

HONOR CODE PLEDGE: "I have neither given nor received aid on this exam, nor have I concealed any violations of the honor code." Closed book; 2 sides of 8.5×11 "cheat sheet."

SIGN YOUR NAME HERE:

CIRCLE ONE: Undergraduate Graduate

Write your answer to each question in the answer space to the right of that question. Problems #1-15 are multiple choice (here same as fill-in-the-blank) worth 5 points each.

1. The **period** of $x[n] = 3\cos(2\pi 0.075n + 1)$ for **integer** n is:
   (a) 1 **(b)** 1/0.075 **(c)** 40 **(d)** 75 **(e)** not periodic

2. $\sin(32\pi t) + \sin(48\pi t)$ is sampled at 40 Hz, then *ideally* interpolated. The result is:
   (a) 0 **(b)** $\sin(16\pi t)$ **(c)** $2\sin(16\pi t)$ **(d)** $\sin(32\pi t)$ **(e)** $2\sin(32\pi t)$

3. The convolution $\{1,2,3\} * \{4,5,6\} =$: **(a)** $\{7,8,9\}$ **(b)** $\{4,13,27,18\}$
   (c) $\{4,13,28,27,18\}$ **(d)** $\{4,14,32,28,18\}$ **(e)** $\{5,11,20,23,9\}$

4. The system (transfer) function of a LTI system described by the difference equation $y[n] + 2y[n-1] + 3y[n-2] = 4x[n] + 5x[n-1] + 6x[n-2]$ is:
   (a) $\frac{z^2+2z+3}{4z^2+5z+6}$ **(b)** $\frac{3z^2+2z+1}{6z^2+5z+4}$ **(c)** $\frac{4z^2+5z+6}{z^2+2z+3}$ **(d)** $\frac{6z^2+5z+4}{3z^2+2z+1}$ **(e)** z^2+z+1

5. The system function of a LTI system with impulse response $h[n] = u[n] + 2^n u[n]$ is:
   (a) $\frac{z+2}{z}$ **(b)** $\frac{z+2}{z-1}$ **(c)** $\frac{z+2}{z^2-3z+2}$ **(d)** $\frac{z^2-3z}{z^2-3z+2}$ **(e)** $\frac{2z^2-3z}{z^2-3z+2}$

6. $\mathcal{Z}\{2^n u[n] + 3^n u[n]\} =$: **(a)** $\frac{z^2-5z+6}{1}$ **(b)** $\frac{1}{z^2+5z+6}$ **(c)** $\frac{5}{z^2+5z+6}$ **(d)** $\frac{2z-5}{z^2-5z+6}$ **(e)** $\frac{2z^2-5z}{z^2-5z+6}$

7. If $H(z) = 6/[(z+1)(z-2)]$, then $h[n] = \mathcal{Z}^{-1}\{H(z)\} =$:
   (a) $2^n u[n] + (-1)^n u[n]$ **(b)** $2^n u[n] - (-1)^n u[n]$ **(c)** $2(2^n)u[n] + 2(-1)^n u[n]$
   (d) $2(2^n)u[n] - 2(-1)^n u[n]$ **(e)** $2^n u[n] + 2(-1)^n u[n] - 3\delta[n]$.

8. The z-transform of $\{\underline{1}, -3, 2\} * u[n]$ is:
   (a) $\frac{z-2}{z}$ **(b)** $\frac{2z^3-4z^2+5z-2}{z^3-z^2}$ **(c)** $1 + 3z^{-1} + 2z^{-2} + \frac{z}{z-1}$ **(d)** $1 - 2z$ **(e)** $z - 2$

9. The impulse response if $\delta[n] + 2^n u[n] \rightarrow \overline{|LTI|} \rightarrow \{\underline{2}, -2\}$ is: **(a)** $\delta[n] - 2^n u[n]$
   (b) $(\frac{1}{2})^n u[n]$ **(c)** $2(\frac{1}{2})^n u[n] - 2(\frac{1}{2})^{n-1} u[n-1]$ **(d)** $\{\underline{1}, -2\}$ **(e)** $2\delta[n] - 2(2^{n-1})u[n-1]$

10. The zero-input response for $y(n)$-$2y(n-1)$=$x(n)$+$x(n-1)$ with $y(-1)$=1 is:
    (a) $2^{n+1}u(n)$ **(b)** $2^n u(n)$ **(c)** $2^{n-1}u(n-1)$ **(d)** $2^n u(n)$+$2^{n-1}u(n-1)$ **(e)** 0

For problems #11-15: An LTI system has transfer function $H(z) = \frac{(z-1)(z-6)}{(z-2)(z-3)}$.

11. The zeros, poles, and BIBO stability of the system are: **(a)** $\{1,6\};\{2,3\}$;stable **(b)** $\{1,6\};\{2,3\}$;unstable **(c)** $\{2,3\};\{1,6\}$;stable **(d)** $\{2,3\};\{1,6\}$;unstable

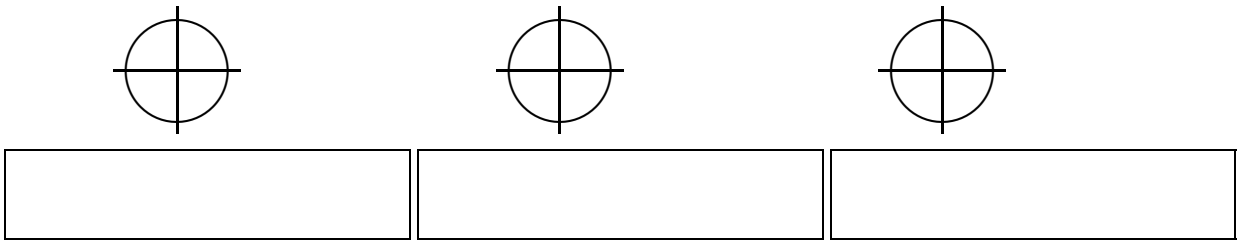
12. The difference equation for the system is:
(a) $y[n] - 7y[n-1] + 6y[n-2] = x[n] - 5x[n-1] + 6x[n-2]$
(b) $6y[n] - 7y[n-1] + y[n-2] = 6x[n] - 5x[n-1] + x[n-2]$
(c) $y[n] - 5y[n-1] + 6y[n-2] = x[n] - 7x[n-1] + 6x[n-2]$
(d) $6y[n] - 5y[n-1] + y[n-2] = 6x[n] - 7x[n-1] + x[n-2]$

13. The response of the system to $x[n] = \{1, -5, 6\}$ is $y[n] =$:
(a) $\{1, -7, 6\}$ **(b)** $(2)^{n+1}u[n] - 2(3)^n u[n]$ **(c)** $\{6, -7, 1\}$ **(d)** $\delta[n] + (2)^{n+1}u[n] - 2(3)^n u[n]$

14. The response of the system to $x[n] = 7$ for all n is $y[n] =$:
(a) 0 **(b)** $\frac{7}{6}\cos(\pi n)$ **(c)** ∞ **(d)** $1.22\cos(\pi n - 0.165)$ **(e)** $1.22\cos(\pi n + 0.165)$

15. The impulse response of the system is $h[n] =$:
(a) $\{1, -7, 6\}$ **(b)** $(2)^{n+1}u[n] - 2(3)^n u[n]$ **(c)** $\{6, -7, 1\}$ **(d)** $\delta[n] + (2)^{n+1}u[n] - 2(3)^n u[n]$

[24] 16. $X(z) = \frac{1}{z-0.5} - \frac{1}{z-3}$ has 3 different inverse z-transforms. For each one, compute: [3@3] **(a)** $x[n]$ [3@3] **(b)** ROCs [3@1] **(c)** if stable [3@1] **(d)** if causal. Write below.



STABLE **CAUSAL** **STABLE** **CAUSAL** **STABLE** **CAUSAL**

[1] 17. Did you: (a) PRINT your name; (b) SIGN your name; (c) CIRCLE grad or undergrad?