Full Name: _____

Do not put any explanations or work in this answer sheet. Only your answers will be considered.

Problem 1 (12%)

(a) $y[n] = x[2n]$

Is the system:

1% (i)	Linear?	**[YES]**	**NO**	**CAN'T TELL**
1% (ii)	Time-invariant?	**YES**	**[NO]**	**CAN'T TELL**
1% (iii)	Causal?	**YES**	**[NO]**	**CAN'T TELL**
1% (iv)	Stable?	**[YES]**	**NO**	**CAN'T TELL**

(b) $y[n] = x[n] + x[n-1]$

Is the system:

1% (i)	Linear?	**[YES]**	**NO**	**CAN'T TELL**
1% (ii)	Time-invariant?	**[YES]**	**NO**	**CAN'T TELL**
1% (iii)	Causal?	**[YES]**	**NO**	**CAN'T TELL**
1% (iv)	Stable?	**[YES]**	**NO**	**CAN'T TELL**

(c) $y[n] = (x[-|n|])^2$

Is the system:

1% (i)	Linear?	**YES**	**[NO]**	**CAN'T TELL**
1% (ii)	Time-invariant?	**YES**	**[NO]**	**CAN'T TELL**
1% (iii)	Causal?	**[YES]**	**NO**	**CAN'T TELL**
1% (iv)	Stable?	**[YES]**	**NO**	**CAN'T TELL**

Problem 2 (6%)

$H_{xy}(z) = bz^{-1} + \frac{1}{1-az^{-1}}$

$H_{ey}(z) = z^{-1}$

Please turn over

Problem 3 (7%)

3% (a) $y[n] = x[n] + \frac{1}{2}x[n-1] + 2y[n-1]$

2% (b) Stable? **YES** **NO** **CAN'T TELL**

2% (c) Causal? **YES** **NO** **CAN'T TELL**

Problem 4 (8%)

2% (a) $h[n] = \delta[n+1] + \delta[n-1]$
$H(z) = z + z^{-1}$

3% (b) $\phi_{yy}[m] = \delta[m+2] + 2\delta[m] + \delta[m-2]$

3% (c) $P_{yy}(\omega) = 2(1 + \cos(2\omega))$

Problem 5 (10%)

4% (a) $H_2(z) = \frac{2(1-\frac{1}{2}z^{-1})}{1-\frac{1}{3}z^{-1}}$

3% (b) $H_2(z)$ unique? **YES** **NO**

3% (c) $H_w(z) = \frac{1-\frac{1}{3}z^{-1}}{1-\frac{1}{2}z^{-1}}$

Problem 6 (6%)

3% (a) $T = \frac{1}{6000}$

3% (b) Choice of T unique? **NO**.
Specify another choice of T if answer is no: $T = \frac{7}{6000}$

Problem 7 (9%)

4% (a) $y_c(t) = 6\pi\cos(6\pi t + \frac{\pi}{2}) = -6\pi\sin(6\pi t)$

5% (b) $y_c(t) = 6\pi\cos(6\pi t + \frac{\pi}{2})$

Problem 8 (8%)

3% (a) $H(z) = \frac{(1+jz^{-1})(1-jz^{-1})}{(1-\frac{1}{2}z^{-1})(1-2z^{-1})}$

2% (b) Can system be causal and stable? **YES** **NO**

3% (c) If system is stable, $h[n] = 0 \; \forall \; n > m$ or $\forall \; n < m$ for finite integer m? **YES** **NO**

Please turn over

Problem 9 (10%)

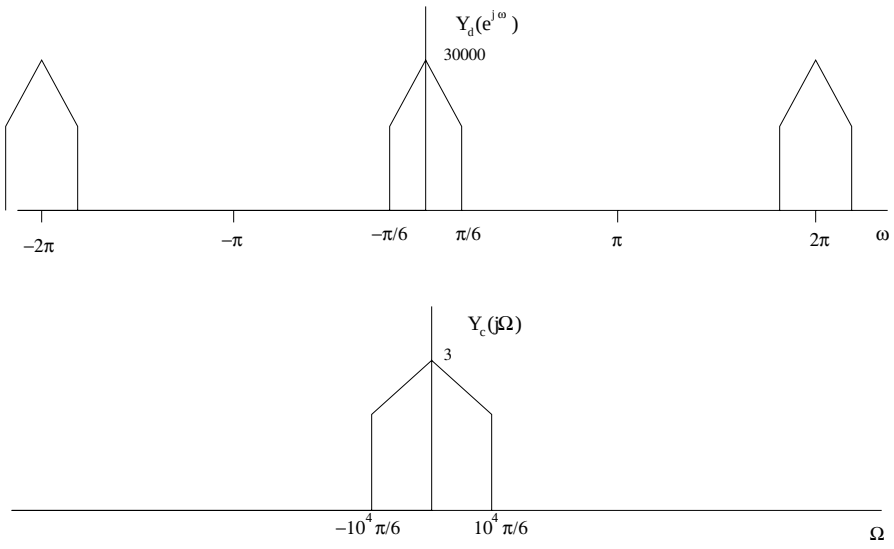
2% (a) $h[n]$ real-valued? **YES** **NO**

2% (b) $\sum_{n=-\infty}^{\infty} |h[n]|^2 = \frac{1}{2\pi} \int_{-\pi}^{\pi} |H(e^{j\omega})|^2 d\omega = 1$

6% (c) Response of the system: $y[n] = s[n] \cos(\omega_c n - \frac{\pi}{2})$

Problem 10 (7%)

5% (a) Sketch $Y_d(e^{j\omega})$ and $Y_c(j\Omega)$:



2% (b) $\sum_{n=-\infty}^{\infty} y_d[n] = Y_d(e^{j0}) = \frac{1}{T_1} = 3 \times 10^4$

Problem 11 (5%)

Output of the system: $y[n] = s_1[n-39]\cos(\frac{3\pi}{4}n - \pi)$

Problem 12 (3%)

(Circle one) $\boxed{\text{A}}$ B C D E

Problem 13 (9%)

2% (a) $H(j\Omega) = e^{-j\Omega\frac{T}{3}}$ for $|\Omega| < \frac{\pi}{T}$, 0 otherwise.

2% (b) (Circle one) A $\boxed{\text{B}}$ C D E

2% (c) $y_d[n] = y_c(nT)$

3% (d) $h[n] = \frac{\sin(\pi(n-\frac{1}{3}))}{\pi(n-\frac{1}{3})}$

Problem 14 (0%)

The best estimate of my grade is: 100