# Final exam answers

## 1 Matching time and frequency representations

**a.**

1    5    0    0
A    B    C    D
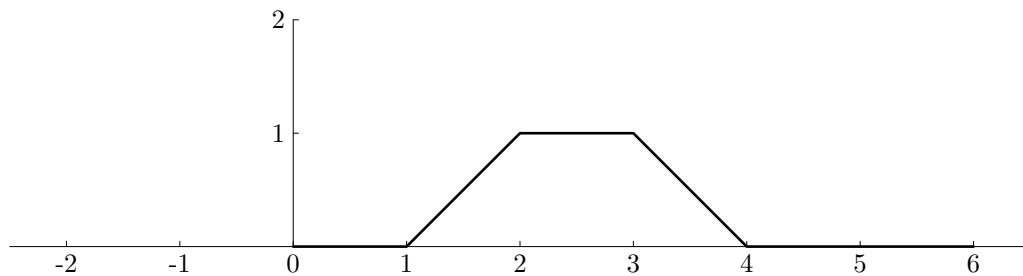
**b.**

5    1    0    0
A    B    C    D

**c.**

0    0    5    0
A    B    C    D

## 2 Discrete-time periodicity

Answer is 15.

## 3 Find the output signal

# 4 Frequency response

**a.**

| 2 | 0 | 0 | 2 | 0 | 0 | 0 | 5 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

**b.**

| 0 | 2 | 0 | 3 | 5 | 3 | 3 | 0 | 2 | 0 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

# 5 Mystery cosine

Answer is $\pi/3, 2\pi + \pi/3, 2\pi - \pi/3$.

# 6 Discrete-time poles and zeros

**a.**

| 0 | 5 | 2 | 0 | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | $\geq 3$ |

**b.**

| 1 | 5 | 0 | 0 | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | $\geq 3$ |

# 7 Taking medicine

**a.** Answer is $1/\ln 1.5 \approx 2.5$.

**b.** Answer is $8\,\text{hours}/\ln 1.5 \approx 20\,\text{hours}$.

**c.** Answer is $1/3$.

# 8 Maximizing output samples

Answer is $10^{223}$.

# 9  Musical timbre

**a.**

0　　5　　1

A　　B　　C

**b.**

0　　1　　5

A　　B　　C

# 10  Lightbulb flicker

**a.**  Answer is 0.088 ….

**b.**  Answer is 4.

# 11  Half the unit step

**a.**  Answer is 1.

**b.**  Answer is 0.5.

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