

# Unit 10 - Week 8

## Course outline

How does an NPTEL online course work?

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Week 2

Week 3

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Week 6

Week 7

Week 8

Strongly Transitive Systems (cont.)

Introduction to Symbolic Dynamics

Shift Spaces

Quiz : Assignment 8

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Assignment Solution

## Assignment 8

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-03-25, 23:59 IST.

Pick the correct options from each question. There is no negative marking

1) Which of the following shift spaces is/are strongly transitive; ( $cl$  means closure and  $0^n$  means  $000\dots 00$  n-times.)

1 point

- $X_1 = cl\{0^k 10^{3^{n_1}} 10^{3^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_2 = cl\{0^k 10^{5^{n_1}} 10^{5^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_3 = cl\{0^k 10^{n_1} 10^{n_2} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_4 = cl\{0^k 10^{2^{n_1}} 10^{2^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

- $X_1 = cl\{0^k 10^{3^{n_1}} 10^{3^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_2 = cl\{0^k 10^{5^{n_1}} 10^{5^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_3 = cl\{0^k 10^{n_1} 10^{n_2} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_4 = cl\{0^k 10^{2^{n_1}} 10^{2^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$

2) Which of the following shift spaces is/are strongly transitive but not weakly mixing; ( $cl$  means closure and  $0^n$  means  $000\dots 00$  n-times.)

1 point

- $X_1 = cl\{0^k 10^{3^{n_1}} 10^{3^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_2 = cl\{0^k 10^{5^{n_1}} 10^{5^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_3 = cl\{0^k 10^{n_1} 10^{n_2} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_4 = cl\{0^k 10^{2^{n_1}} 10^{2^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

- $X_1 = cl\{0^k 10^{3^{n_1}} 10^{3^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_2 = cl\{0^k 10^{5^{n_1}} 10^{5^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$
- $X_4 = cl\{0^k 10^{2^{n_1}} 10^{2^{n_2}} 1\dots : k \geq 0, n_i \in \mathbb{N}\}$

3) Which of the following statement(s) is/are true;

1 point

- A strongly transitive system is always weak mixing
- A weak mixing system need not to be strongly transitive
- Every mixing system is strongly transitive
- Every strongly transitive system is mixing

No, the answer is incorrect.

Score: 0

Accepted Answers:

- A weak mixing system need not to be strongly transitive
- Every mixing system is strongly transitive

4) Which of the following is/are the factor of the two shift  $(\{0, 1\}^{\mathbb{Z}}, \sigma)$ ;

1 point

- The Tent map on  $[0, 1]$
- The Logistic map on  $[0, 1]$
- The 3-shift  $(\{0, 1, 2\}^{\mathbb{Z}}, \sigma)$
- The system defined by the map  $f : [0, 1] \rightarrow [0, 1]$  defined as  $f(x) = \begin{cases} 2x & 0 \leq x \leq \frac{1}{2} \\ \frac{3}{2} - x & \frac{1}{2} \leq x \leq 1 \end{cases}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

- The Tent map on  $[0, 1]$
- The Logistic map on  $[0, 1]$

5) Which of the following is/are true in a shift space;

1 point

- $X_{\mathcal{F}_1 \cup \mathcal{F}_2} = X_{\mathcal{F}_1} \cup X_{\mathcal{F}_2}$ .
- $X_{\mathcal{F}_1 \cup \mathcal{F}_2} = X_{\mathcal{F}_1} \cap X_{\mathcal{F}_2}$ .
- $X_{\mathcal{F}_1 \cap \mathcal{F}_2} = X_{\mathcal{F}_1} \cup X_{\mathcal{F}_2}$ .
- $X_{\mathcal{F}_1 \cap \mathcal{F}_2} = X_{\mathcal{F}_1} \cap X_{\mathcal{F}_2}$ .

No, the answer is incorrect.

Score: 0

Accepted Answers:

- $X_{\mathcal{F}_1 \cup \mathcal{F}_2} = X_{\mathcal{F}_1} \cap X_{\mathcal{F}_2}$ .

6) Which of the following is/are a sub-shift of finite type;

1 point

- The alphabet set is  $\{0, 1\}$  and  $\mathcal{F} = \{10^n 1 : 1 \leq n \leq L \text{ for some fixed natural number } L\}$
- The alphabet set is  $\{0, 1\}$  and  $\mathcal{F} = \{10^n 1 : \text{where } n \text{ is a prime number}\}$
- The full shift  $(\{0, 1\}^{\mathbb{Z}}, \sigma)$
- The space of all bi-infinite sequences on  $\{0, 1\}$  such that 1 is always to be followed by 1

No, the answer is incorrect.

Score: 0

Accepted Answers:

- The alphabet set is  $\{0, 1\}$  and  $\mathcal{F} = \{10^n 1 : 1 \leq n \leq L \text{ for some fixed natural number } L\}$
- The full shift  $(\{0, 1\}^{\mathbb{Z}}, \sigma)$
- The space of all bi-infinite sequences on  $\{0, 1\}$  such that 1 is always to be followed by 1

7) Let  $\mathcal{L}(X)$  be the language of a shift space  $(X, \sigma)$ . Which of the following is/are true;

1 point

- Every block  $w \in \mathcal{L}(X)$  cannot be expanded to both sides by concatenating the blocks from  $\mathcal{L}(X)$
- $\mathcal{L}(X)$  is the union of allowed blocks of every length
- There may exist non-conjugate shift spaces with the same language
- $\mathcal{L}(X)$  contains all the sub-blocks of a given block  $w$  from  $\mathcal{L}(X)$

No, the answer is incorrect.

Score: 0

Accepted Answers:

- $\mathcal{L}(X)$  is the union of allowed blocks of every length
- $\mathcal{L}(X)$  contains all the sub-blocks of a given block  $w$  from  $\mathcal{L}(X)$