

## Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

- Lecture 14: Explicit construction of expanders and Zig-Zag product

- Lecture 15: Spectral analysis of Zig-Zag product

- Quiz : Assignment 7**

- Assignment 7 Solution

- Feedback for Week 7

Week 8

Week 9

Week 10

Week 11

Week 12

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# Assignment 7

The due date for submitting this assignment has passed.

**Due on 2021-03-10, 23:59 IST.**

As per our records you have not submitted this assignment.

1) Suppose, we have two graphs  $G$  and  $G'$  such that the largest eigen value of  $G$  is  $a$  while the largest eigen value of the Zig-zag product of  $G$  and  $G'$  is  $c$ . What can we say about the upper-bound on the largest eigen value of  $G'$ ? **1 point**

- $-1 + (1 + a - c)^{1/2}$
- $-1 - (1 + a - c)^{1/2}$
- $-1 + (1 - a + c)^{1/2}$
- $-1 - (1 - a + c)^{1/2}$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $-1 + (1 - a + c)^{1/2}$

2) If  $A$  is an  $n \times n$  matrix with nonnegative entries and all row sums equal to  $r$ . Then which of the following statements is true? **1 point**

- the largest eigen value can be at most  $r$
- the largest eigen value can be at least  $r$
- the second largest eigen value can be at least  $r$
- None of the above

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
*the largest eigen value can be at most  $r$*

3) Here are two statements about product of graphs. **1 point**

A1: Tensor product reduces the degree  
A2: Replacement product reduces the degree  
A3: Matrix product preserves the spectral gap.

Then which of the following options is true?

- A1 and A2 are correct while A3 is wrong
- A1 and A3 are correct while A2 is wrong
- A2 and A3 are wrong while A1 is correct
- A1 and A3 are wrong while A2 is correct.

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
*A1 and A3 are wrong while A2 is correct.*

4) Here are two statements **1 point**

A1: Zig-zag product of two stochastic matrices must be stochastic.  
A2: Tensor product of two stochastic matrices must be stochastic.

- A1 is false while A2 is true
- Both A1 and A2 are true
- Both A1 and A2 are false
- A1 is true while A2 is false

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
*Both A1 and A2 are true*