



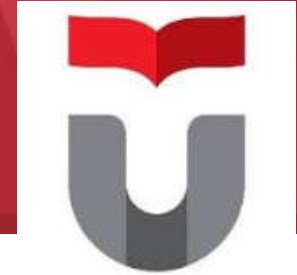
# MUG2A3/ Matematika Diskret

Mahmud Imrona – Rian Febrian Umbara

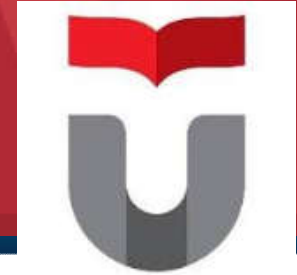
Pemodelan dan Simulasi



## Graph



# **Representasi Graph Matriks Ketetanggaan dan Bersisian**



# Representasi Graph

## 1. Matriks Ketetanggaan

*(adjacency matrix)*

## 2. Matriks Bersisian

*(incidency matrix)*

## 3. Senarai Ketetanggaan

*(adjacency list)*



# Matriks Ketetanggaan (*adjacency matrix*)

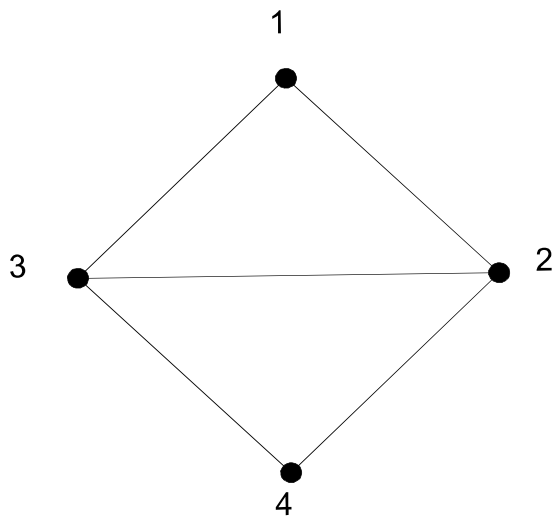
$$A = [a_{ij}],$$

$$a_{ij} = \begin{cases} 1, & \text{jika simpul } i \text{ dan } j \text{ bertetangga} \\ 0, & \text{jika simpul } i \text{ dan } j \text{ tidak bertetangga} \end{cases}$$



# Matriks Ketetanggaan (*adjacency matrix*)

## ▶ Graph



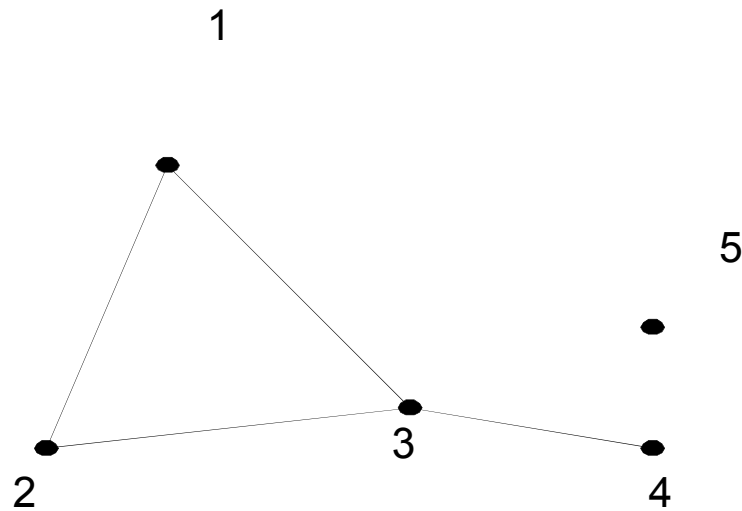
## ▶ Matriks Ketetanggaan

	1	2	3	4
1	0	1	1	0
2	1	0	1	1
3	1	1	0	1
4	0	1	1	0



# Matriks Ketetanggaan (*adjacency matrix*)

## ▶ Graph



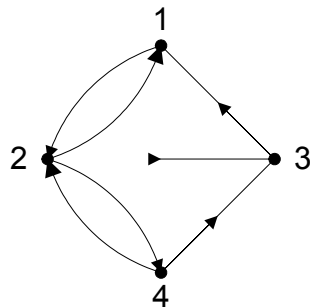
## ▶ Matriks Ketetanggaan

	1	2	3	4	5
1	0	1	1	0	0
2	1	0	1	0	0
3	1	1	0	1	0
4	0	0	1	0	0
5	0	0	0	0	0



# Matriks Ketetanggaan (*adjacency matrix*)

## Graph



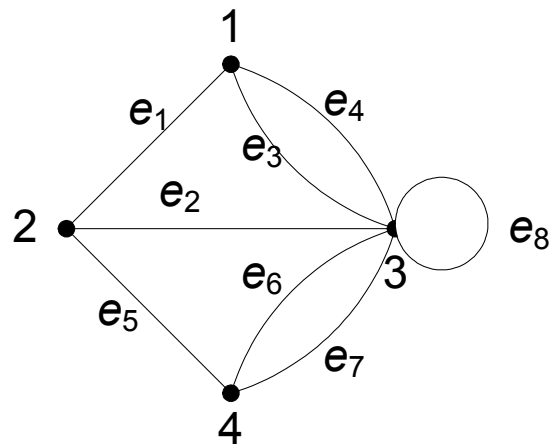
## Matriks Ketetanggaan

	1	2	3	4
1	0	1	0	0
2	1	0	1	1
3	1	0	0	0
4	0	1	1	0



# Matriks Ketetanggaan (*adjacency matrix*)

## Graph



## Matriks Ketetanggaan

	1	2	3	4
1	0	1	2	0
2	1	0	1	1
3	2	1	1	2
4	0	1	2	0





## Derajat tiap simpul $i$ :

(a) Untuk graph tak-berarah,

$$d(v_i) = \sum_{j=1}^{i-1} a_{ij} + 2a_{ii} + \sum_{j=i+1}^n a_{ij}$$

(b) Untuk graph berarah,

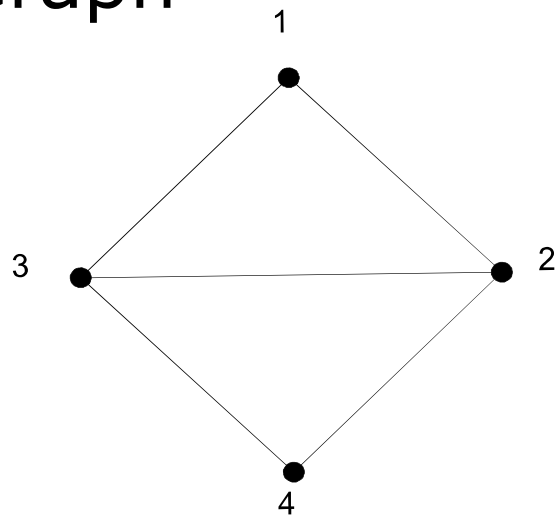
$$d_{in}(v_j) = \text{jumlah nilai pada kolom } j = \sum_{i=1}^n a_{ij}$$

$$d_{out}(v_i) = \text{jumlah nilai pada baris } i = \sum_{j=1}^n a_{ij}$$



## Derajat tiap simpul

### ▶ Graph



Derajat simpul 2 =  $1+0+1+1 = 3$

Derajat simpul 4 =  $0+1+1+0 = 2$

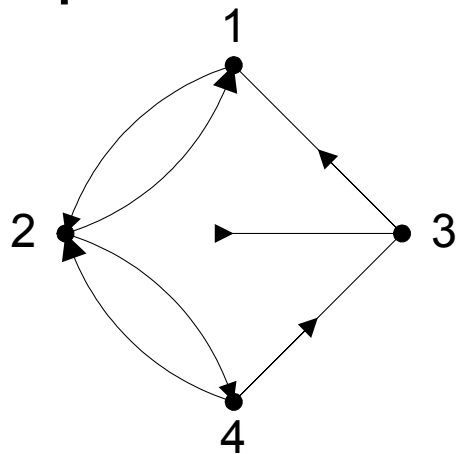
### ▶ Matriks Ketetanggaan

	1	2	3	4
1	0	1	1	0
2	1	0	1	1
3	1	1	0	1
4	0	1	1	0



## Derajat tiap simpul

### Graph

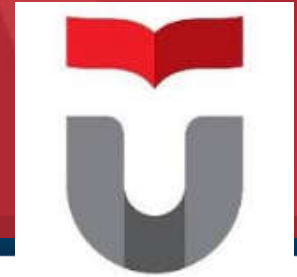


Derajat masuk (in degree)  
simpul 2 =  $1+0+0+1 = 2$

Derajat keluar (out degree)  
simpul 2 =  $1+0+1+1 = 3$

### Matriks Ketetanggaan

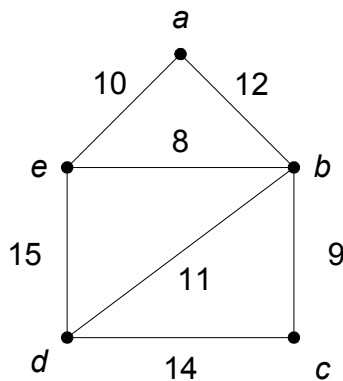
	1	2	3	4
1	0	1	0	0
2	1	0	1	1
3	1	0	0	0
4	0	1	1	0



# Matriks Ketetanggaan Graph Berbobot

## Graph

Tanda  $\infty$  bila tdk ada sisi  
dari simpul  $i$  ke  $j$



## Matriks Ketetanggaan

	$a$	$b$	$c$	$d$	$e$
$a$	$\infty$	12	$\infty$	$\infty$	10
$b$	12	$\infty$	9	11	8
$c$	$\infty$	9	$\infty$	14	$\infty$
$d$	$\infty$	11	14	$\infty$	15
$e$	10	8	$\infty$	15	$\infty$



# Matriks Bersisian (*incidency matrix*)

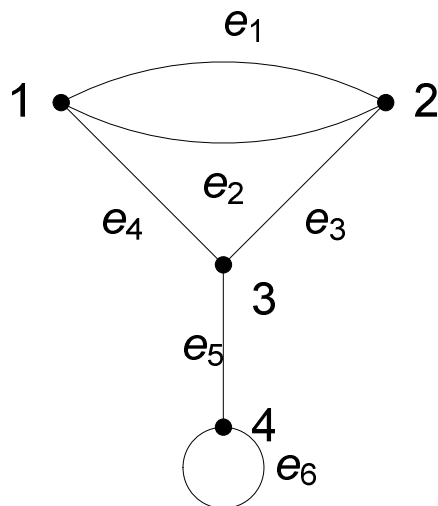
$$A = [a_{ij}],$$

$$a_{ij} = \begin{cases} 1, & \text{jika simpul } i \text{ bersisian dengan sisi } j \\ 0, & \text{jika simpul } i \text{ tidak bersisian dengan sisi } j \end{cases}$$



# Matriks Bersisian (*incidency matrix*)

## Graph



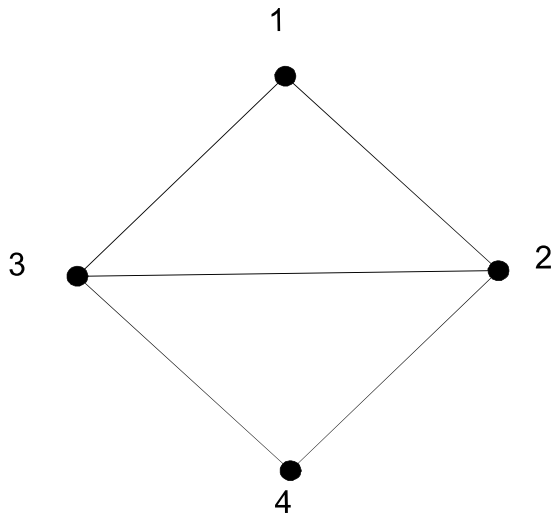
## Matriks Bersisian

	e1	e2	e3	e4	e5	e6
1	1	1	0	1	0	0
2	1	1	1	0	0	0
3	0	0	1	1	1	0
4	0	0	0	0	1	1



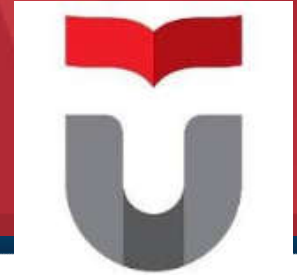
# Senarai Ketetanggaan (*adjacency list*)

## ▶ Graph



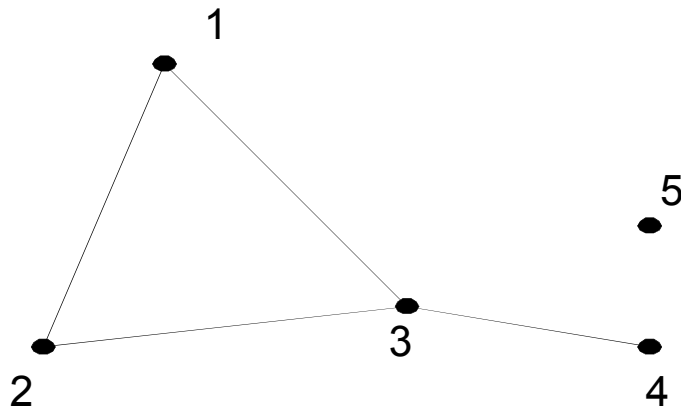
## ▶ Senarai Ketetanggaan

Simpul	Simpul Tetangga
1	2, 3
2	1, 3, 4
3	1, 2, 4
4	2, 3



# Matriks Ketetanggaan (*adjacency matrix*)

## ▶ Graph



## ▶ Senarai Ketetanggaan

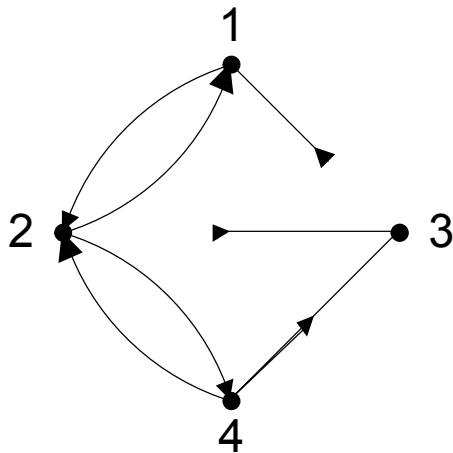
Simpul	Simpul Tetangga
1	2, 3
2	1, 3
3	1, 2, 4
4	3
5	-





# Senarai Ketetanggaan (*adjacency list*)

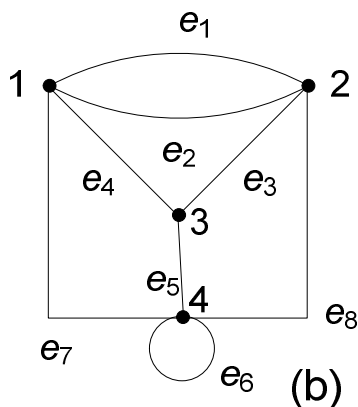
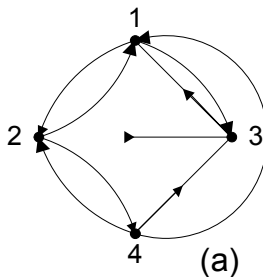
## Graph



## Senarai Ketetanggaan

Simpul Awal	Simpul Terminal
1	2
2	1, 3, 4
3	1
4	2, 3

## Latihan

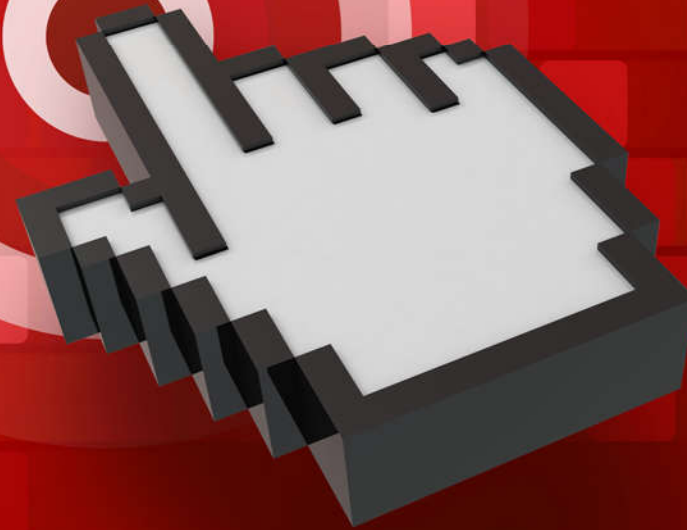


Perhatikan graph (a) dan (b) disamping:

- ▶ Buatlah matriks ketetanggaan (adjacency)
- ▶ Buatlah matriks bersisian (incidency)
- ▶ Tuliskan dalam bentuk tabel
- ▶ Berapakah derajat in dan derajat out pada gambar (a) pada setiap node?
- ▶ Berapakah derajat pada gambar (b) pada setiap node?



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**THANK YOU**