**ASSIGNMENT 4   
JOB SCHEDULING/SEQUENCING**

**Advanced mathematical modeling for managerial decisions**

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# **Q1a Solution**

**Parameters:**

N = Number of jobs  
Pj = Processing time for job j  
Dj = Due date for job j

**Decision variables:**

Zij = 1 if job i is processed before job j, 0 otherwise  
Cj = Completion time for job j  
Tj = Tardiness for job j

**Objective:**

Minimize

**Constraints:**

1. For every job, number of successors + number of predecessors = N – 1
2. Completion time formula
3. If job i is processed before j, the number of predecessors of job j must be greater than the number of predecessors of job i by at least 1
4. If job i is processed after job j, the number of predecessors of job j must be lesser than the number of predecessors of job i by at least 1
5. Tardiness = Max (0, Cj-Dj)

**Results:**

objective: Tardiness

Tardiness = 9

Z [\*,\*]

: 1 2 3 4 5 :=

1 0 0 0 1 1

2 1 0 1 1 1

3 1 0 0 1 1

4 0 0 0 0 1

5 0 0 0 0 0

;

C [\*] :=

1 13

2 1

3 6

4 15

5 21

;

T [\*] :=

1 5

2 0

3 0

4 1

5 3

;

# **Q1b Solution**

**Parameters:**

N = Number of jobs  
Pj = Processing time for job j  
Dj = Due date for job j  
M =

**Decision variables:**

Zjt = 1 if job j starts at time t, 0 otherwise  
Cj = Completion time for job j  
Tj = Tardiness for job j

**Objective:**

Minimize

**Constraints:**

1. A job can start at only one point in time
2. No more than 1 jobs can start at a point in time
3. Completion time formula
4. Start time of starting at time t >= Completion time of all jobs starting before t and ending by t
5. Tardiness = Max (0, Cj-Dj)

**Results:**

objective: Tardiness

Tardiness = 9

Z [\*,\*] (tr)

: 1 2 3 4 5 :=

0 0 1 0 0 0

1 0 0 1 0 0

2 0 0 0 0 0

3 0 0 0 0 0

4 0 0 0 0 0

5 0 0 0 0 0

6 1 0 0 0 0

7 0 0 0 0 0

8 0 0 0 0 0

9 0 0 0 0 0

10 0 0 0 0 0

11 0 0 0 0 0

12 0 0 0 0 0

13 0 0 0 1 0

14 0 0 0 0 0

15 0 0 0 0 1

16 0 0 0 0 0

17 0 0 0 0 0

18 0 0 0 0 0

19 0 0 0 0 0

20 0 0 0 0 0

21 0 0 0 0 0

;

C [\*] :=

1 13

2 1

3 6

4 15

5 21

;

T [\*] :=

1 5

2 0

3 0

4 1

5 3

;