

# Project Planning & Control

## *Lesson 3*

### *Time-Cost trade-off: Class Exercise- 2*

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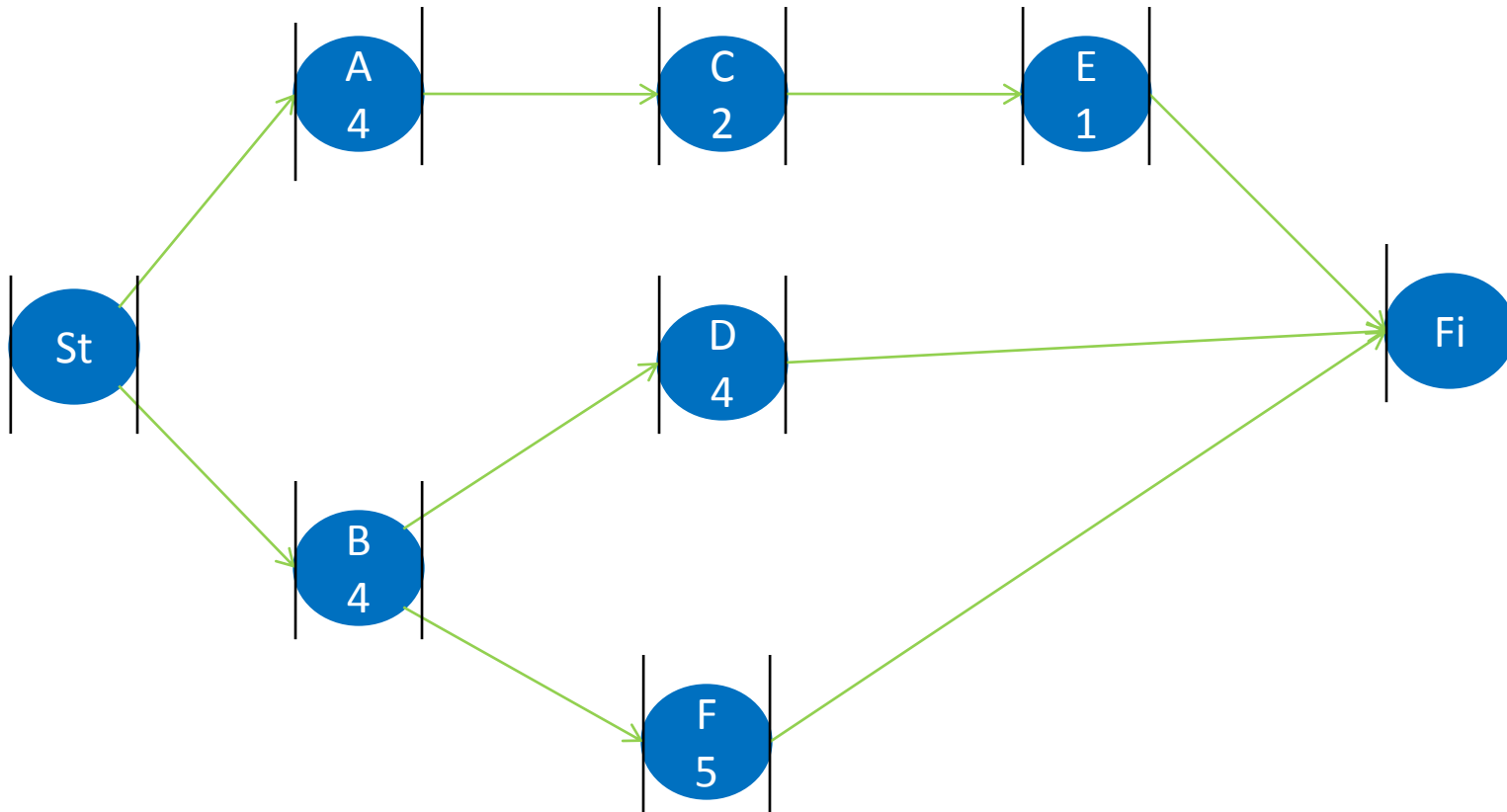
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# Class exercise 2



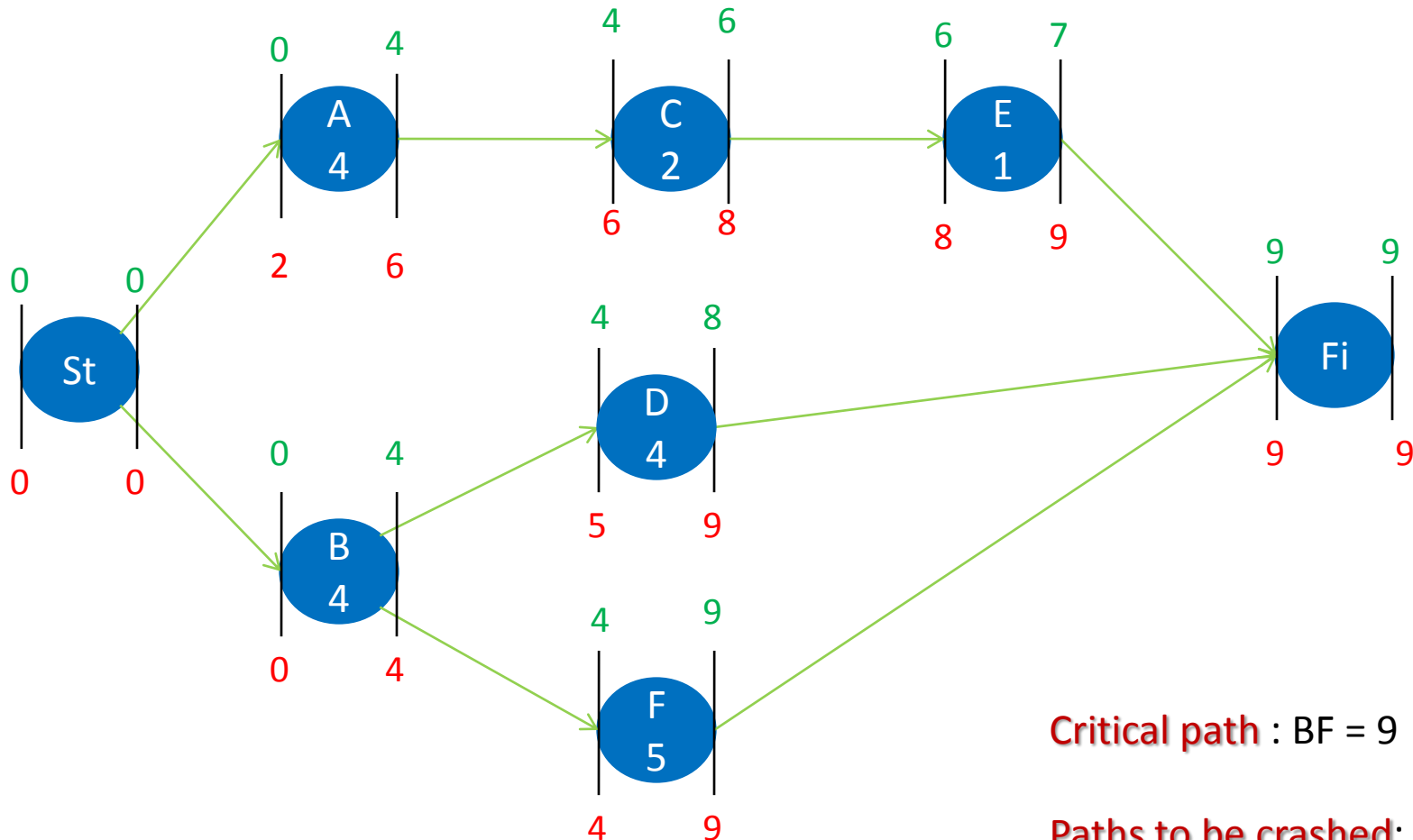
Activity	Normal Duration (ND) (days)	Crash Duration (CD) (days)	Normal Cost (NC) u	Crash Cost (CC) u	Cost slope=(CC-NC)/(ND-CD)
A	4	3	100	125	
B	4	3	250	400	
C	2	1	150	300	
D	4	1	450	900	
E	1	0.5	200	400	
F	5	2	200	350	

Assume an indirect cost of u125/day. Develop the least cost curve for the project.

# Solution



Forward pass



Critical path : BF = 9

Paths to be crashed: ACE = 7

BD = 8

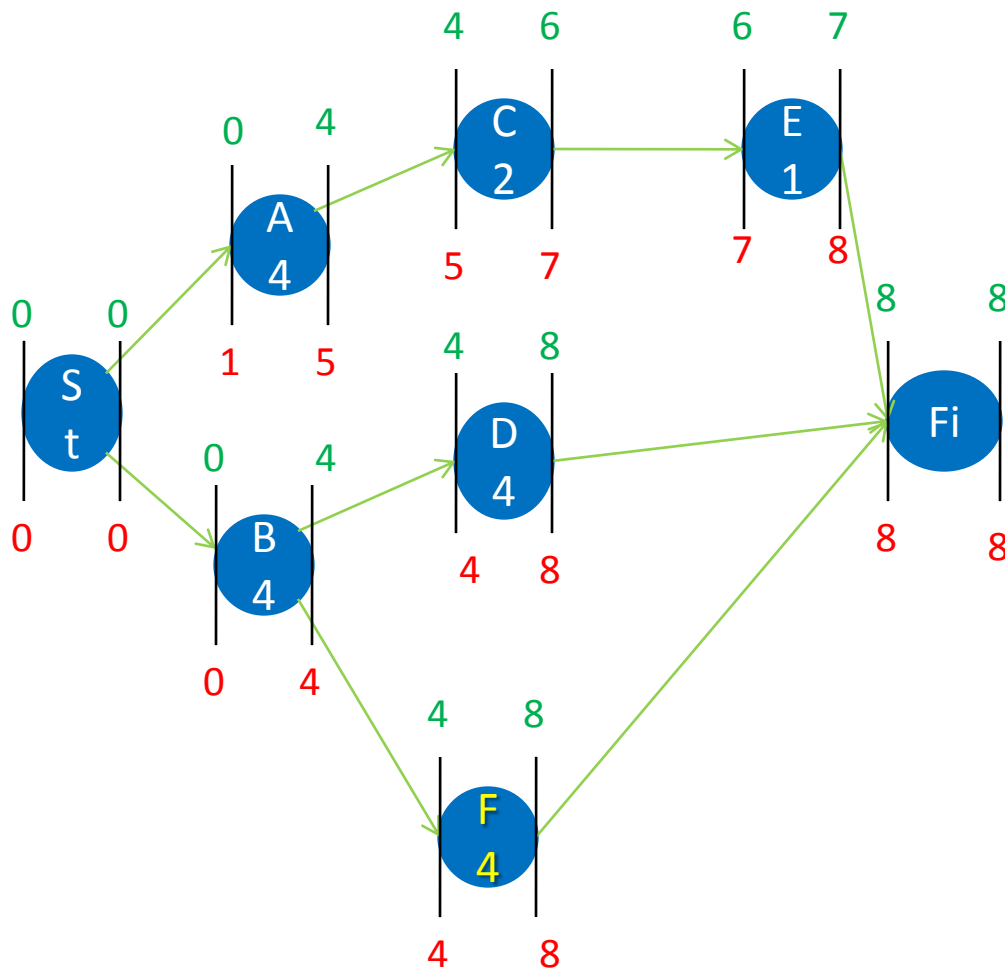
BF = 9



Backward pass

# SOLUTION

Activity	Normal Duration (ND) (days)	Crash Duration (CD) (days)	Normal Cost (NC) (u)	Crash Cost (CC) (u)	Cost slope=(C-C-NC)/(ND-CD)	Available crash time
A	4	3	100	125	25	1
B	4	3	250	400	150	1
C	2	1	150	300	150	1
D	4	1	450	900	150	3
E	1	0.5	200	400	400	0.5
F	5	2	200	350	50	3
		Normal Direct Cost=	1350			



**Step 1:** Crash the critical path **BF**.

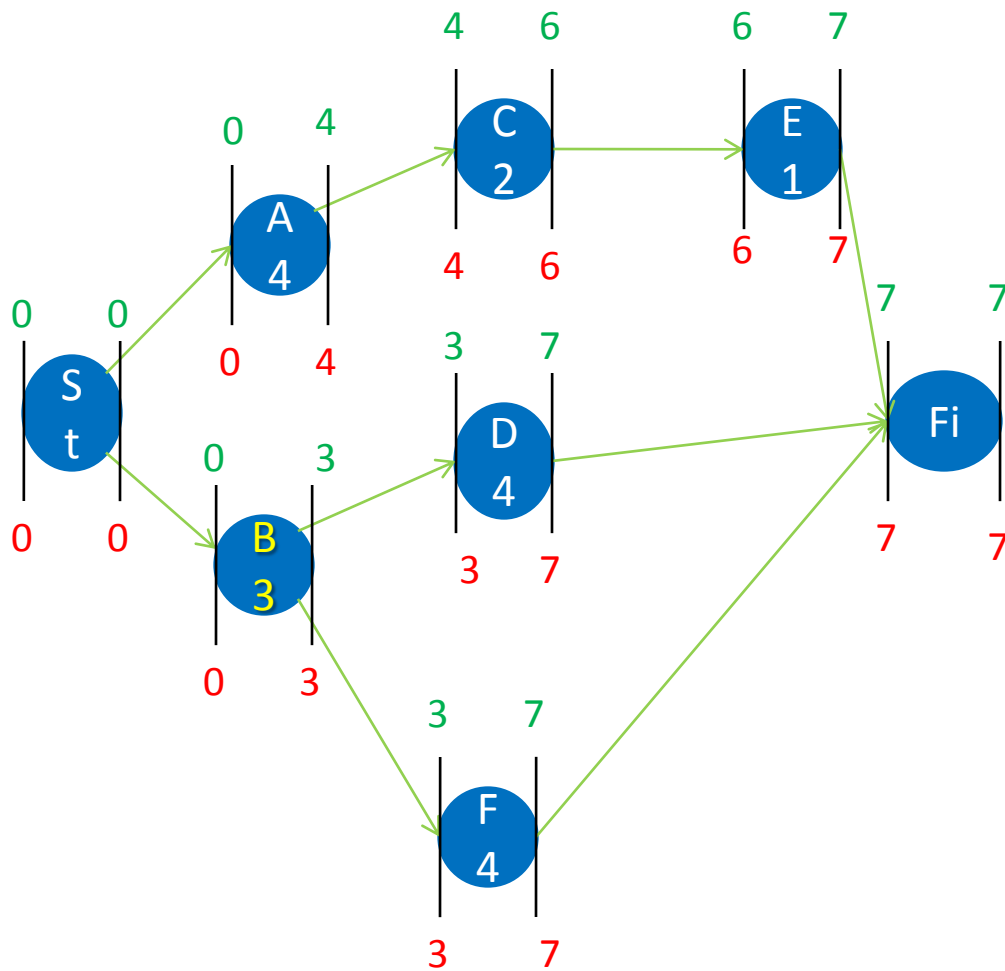
Option available to crash

B= u150

F= u 50 ✓

Crash F by 1 days= u 50

Now path BF and BD are critical with 8days.



**Step 2:** Crash the critical path **BF** and **BD**.

Option available to crash

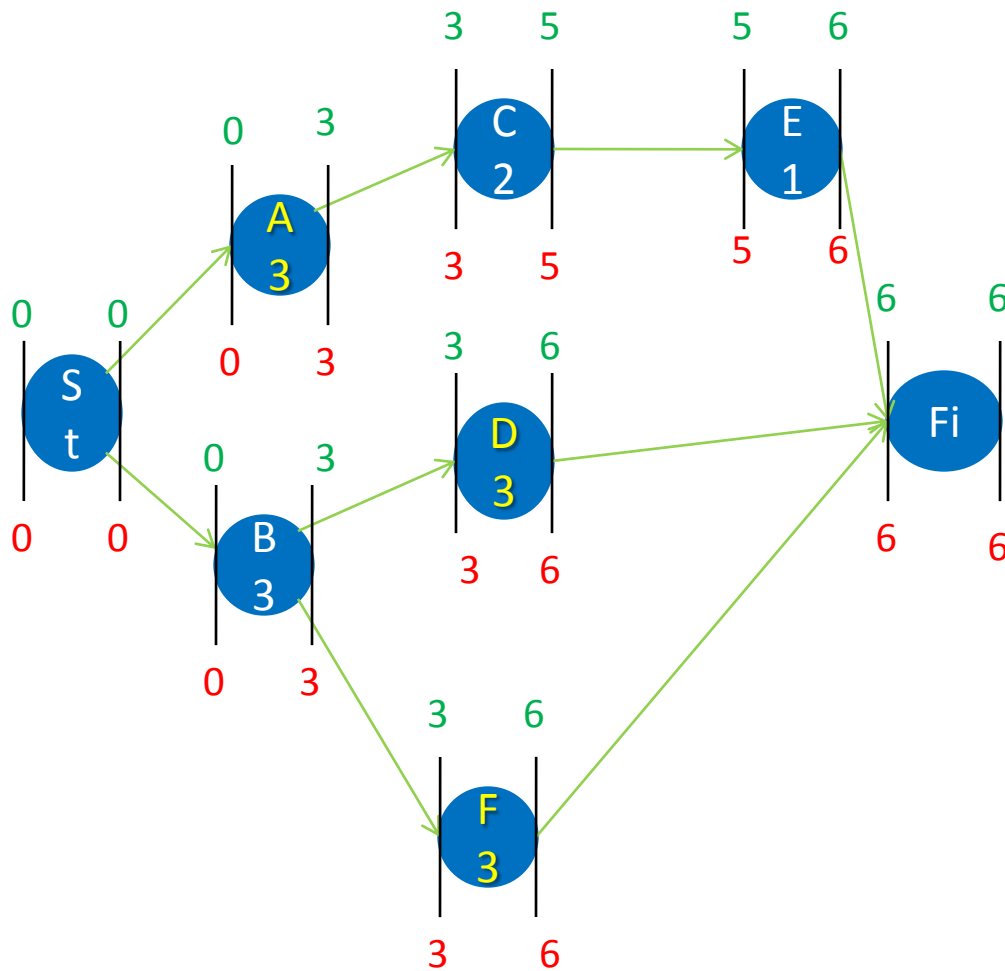
B= u150 ✓

DF= 150 + 50= u 200

Crash B by 1 days= u 150

B can not be crashed further

Now path BF ,BD and ACE are critical with 7days.



**Step 3:** Crash the critical path **BF, BD, and ACE**.

Option available to crash

CDF =  $150 + 150 + 50 = \text{u}350$

ADF =  $150 + 50 + 25 = \text{u} 225$  ✓

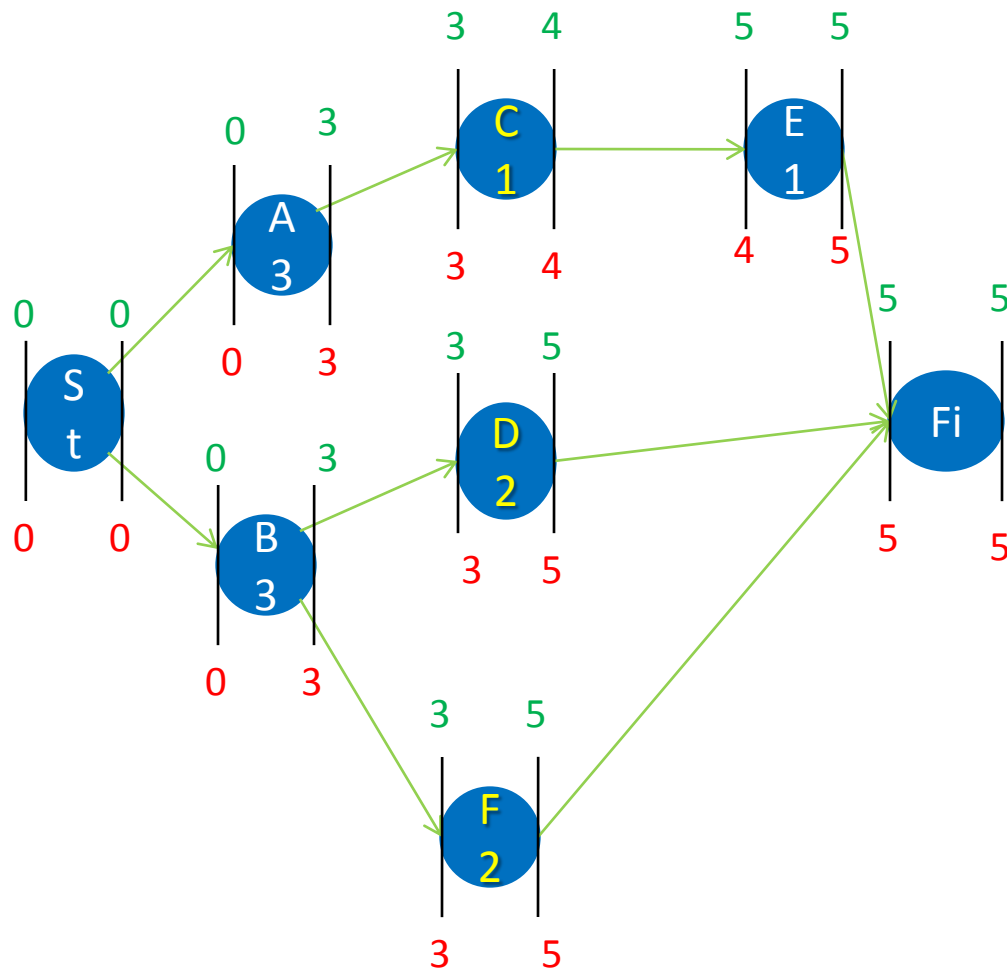
EDF =  $400 + 150 + 50 = \text{u} 600$

Crash ADF by 1 days = u 225

A can not be crashed further

Now path BF, BD and ACE are critical with 6 days.





**Step 4:** Crash the critical path **BF, BD, and ACE**.

**Option available to crash**

CDF = 150 + 150 + 50 = u350 ✓

EDF = 400 + 150 + 50 = u 600

Crash CDF by 1 days = u 350

**C and F can not be crashed further**

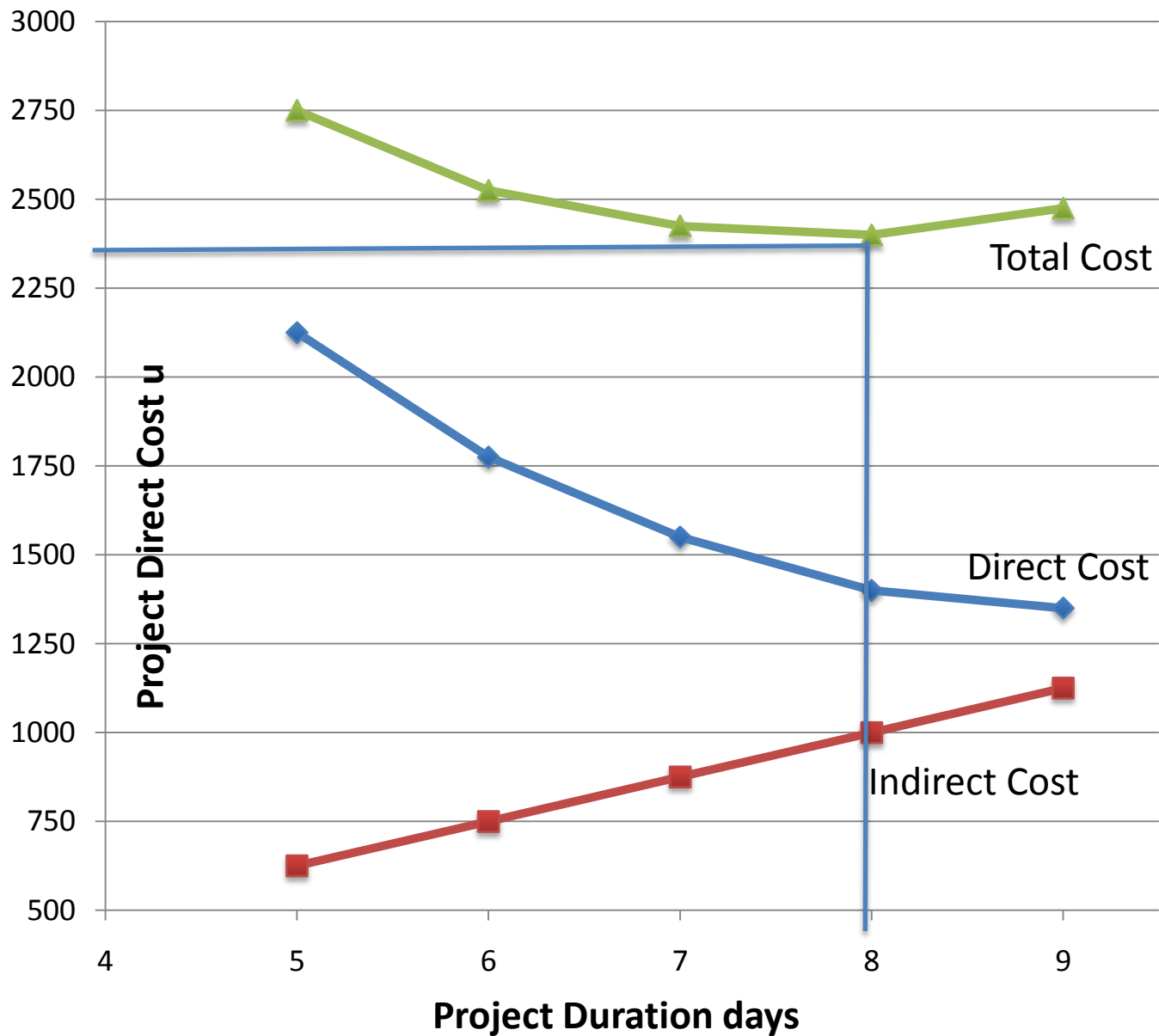
Now path BF, BD and ACE are critical with 5 days but can not be crashed further since all activities have been crashed to full extent (depending on available crash time).

# Cost table : Direct, Indirect, Total cost

Duration (days)	Direct cost (u)	Indirect cost/day	Total Indirect cost (u)	Total cost (u)
9	1350	125	1125	2475
8	1400	125	1000	2400
7	1550	125	875	2425
6	1775	125	750	2525
5	2125	125	625	2750

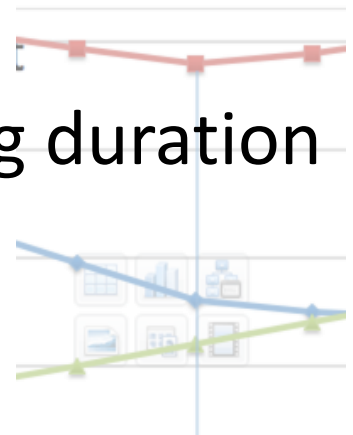
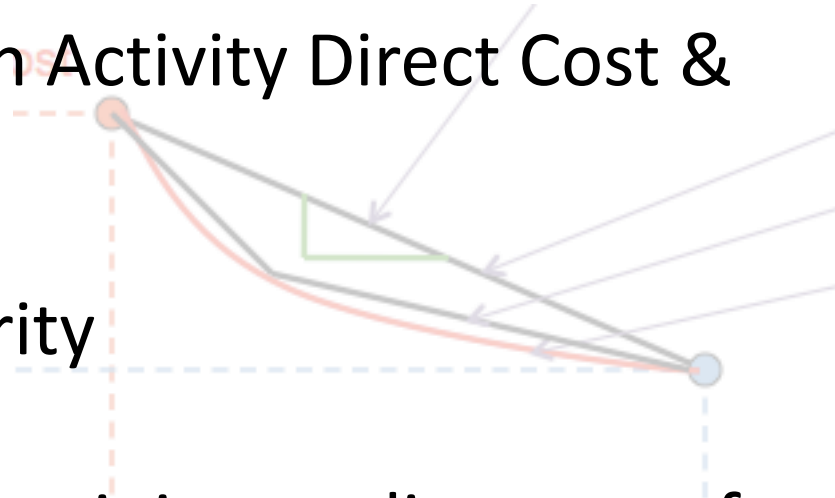
Optimum total cost = u2400

Optimum duration = 8 days



# Summary

- Relationship between Activity Direct Cost & Duration
- Assumption of linearity
- Procedure for finding minimum direct cost for crashed project durations
- Including overhead costs & determining duration at which total cost is minimum



## Problem -3

- Develop a network diagram and develop least cost curve for the project. Assume an indirect cost of u200/day.

Activity	Preceded by	Crash cost (CC) (u)	Normal cost (NC) (u)	Crash duration (CD) (days)	Normal duration (ND) (days)
A	-	3,900	3,600	6	7
B	A	6,500	5,500	3	5
C	B	7,200	6,350	7	9
D	B	4,900	4,700	18	19
E	B	2,200	2,050	9	10
F	C	1,700	1,200	6	8
G	F	7,200	7,200	5	5
H	E	10,000	9,450	10	11
I	D,G,H	4,700	4,500	6	7