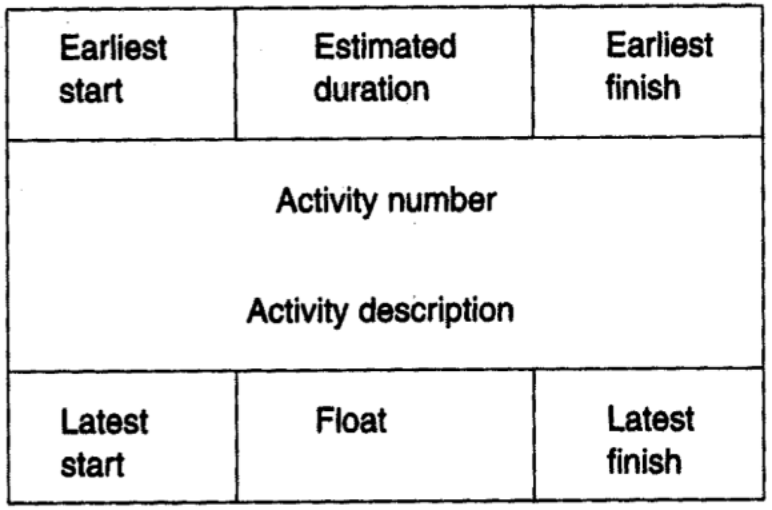
INST0031
Systems Management

Seminar 3

- Activity on Node
- Total Float (Slack)
- Free Float (Slack

Activity on Node



- Forward Path:

  Earliest start = Preceding activity earliest finish

  Earliest finish = Earliest start + estimated duration

- Backward Path:

  Latest finish = Succeding activity latest start

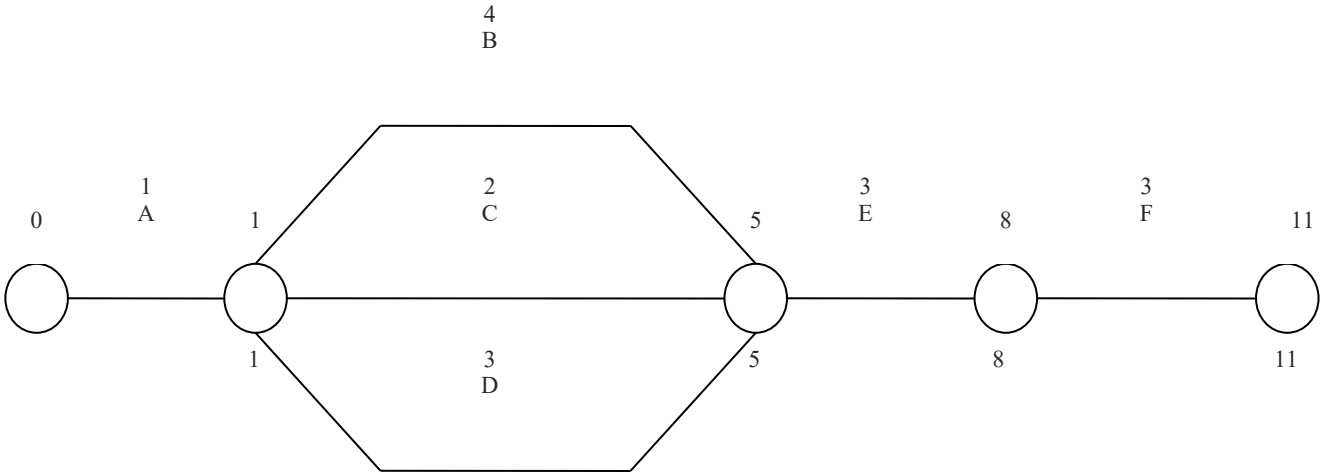
  Latest start = Latest finish – activity duration

- Float (Slack) = Latest finish – Earliest finish

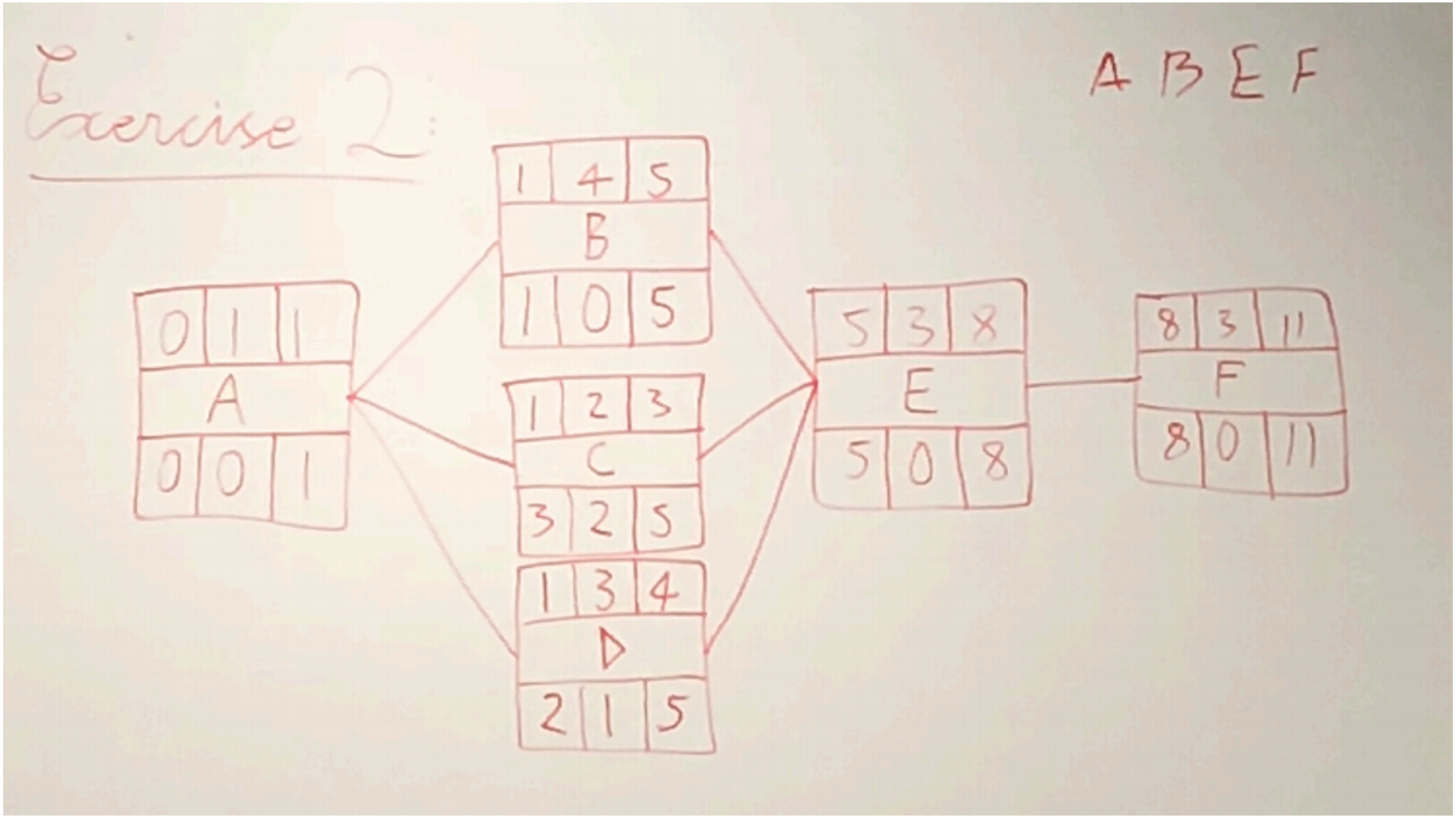
Exercise 2 – Convert to Activity on Node

- *Draw a Network diagram and determine the Critical Path and duration of the project (in days) for the following data.*

Activity	Durations (Days)	Preceding Activity
A	1	-
B	4	A
C	2	A
D	3	A
E	3	B,C,D
F	3	E



Solution


Exercise 2:
A B E F
0 1 1
A
0 0 1
1 4 5
B
1 0 5
1 2 3
C
3 2 5
1 3 4
D
2 1 5
5 3 8
E
5 0 8
8 3 11
F
8 0 11

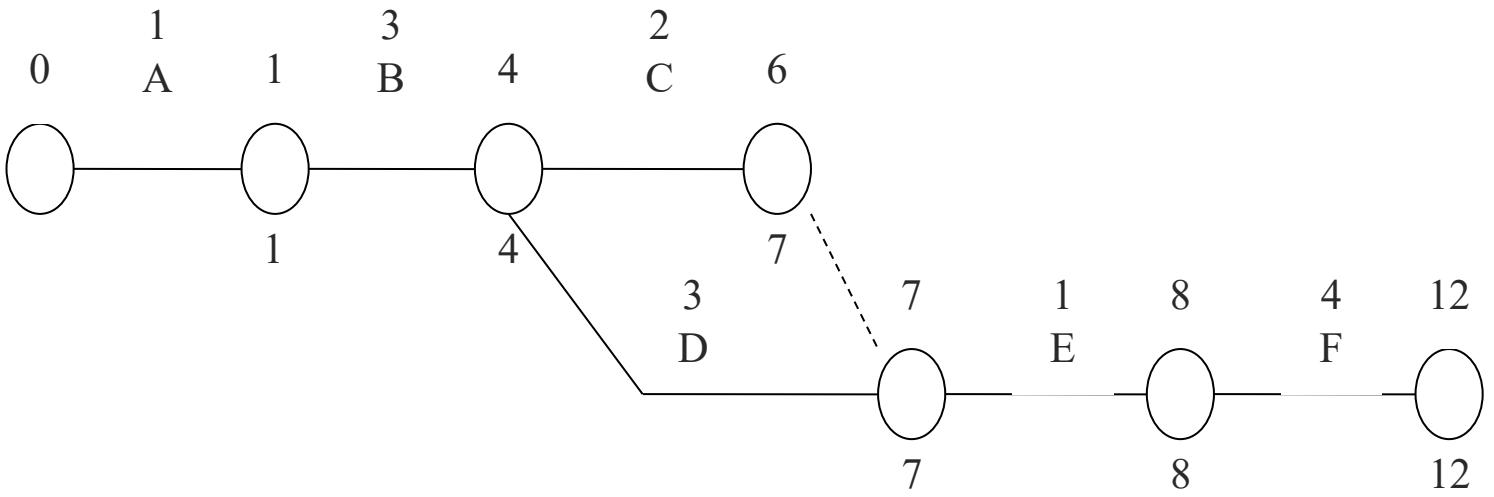
Exercise 6 – Activity on Arrow

- *Draw the Network diagram and determine the Critical Path and duration of the project (in days).*

Activity	Activity	Durations (Days)	Resources used	Preceding Activity
A	Cut material	1	Machine A	-
B	Drill material	3	Machine B	A
C	Cut material	2	Machine A	B
D	Shape material	3	Machine C	B
E	Cut material	1	Machine A	D
F	Polish material	4	Machine D	C,E

- *What is the most that activity **C** could be increased by to have no affect on the overall duration of the project? Could activity **B** be increased by 2 days and have no affect on the overall duration of the project? What level of slack is available on activity **D** ?*

Solution

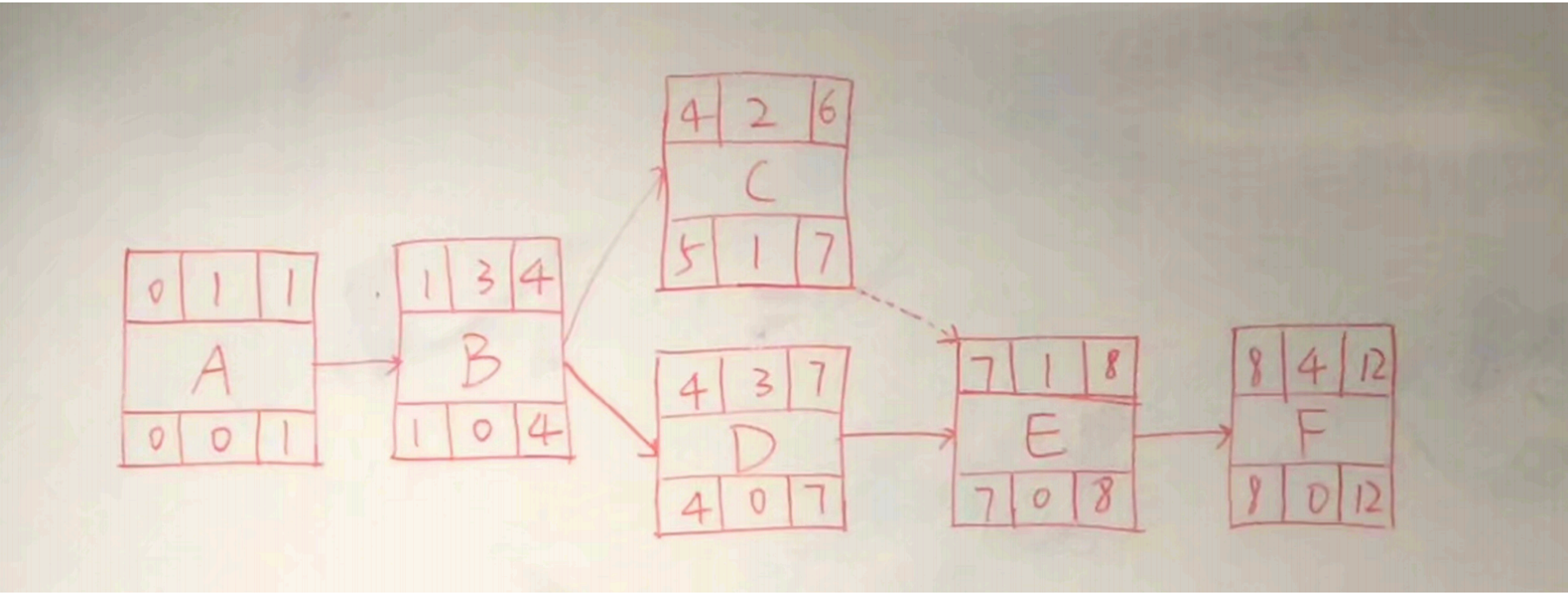


- C & E precede F, but C uses the same resource as E, therefore E is actually indirectly dependent on C! As E precedes F and depends on C we don't need to draw *another* line to link C and F – the path, and hence the dependency, is already there.
- The critical path is ABDEF, duration 12 days.
- C could be increased by 1 (not 2!) without affecting the overall duration (it has a float of 1, derived from the dependency of E, **not** F).
- Any increase in the duration of B will have a direct impact on the overall duration as it is on the critical path.
- There is no slack (float) on D as again it is on the critical path.

Exercise 6

- Change your diagram to activity on node

Exercise 6 - Solution

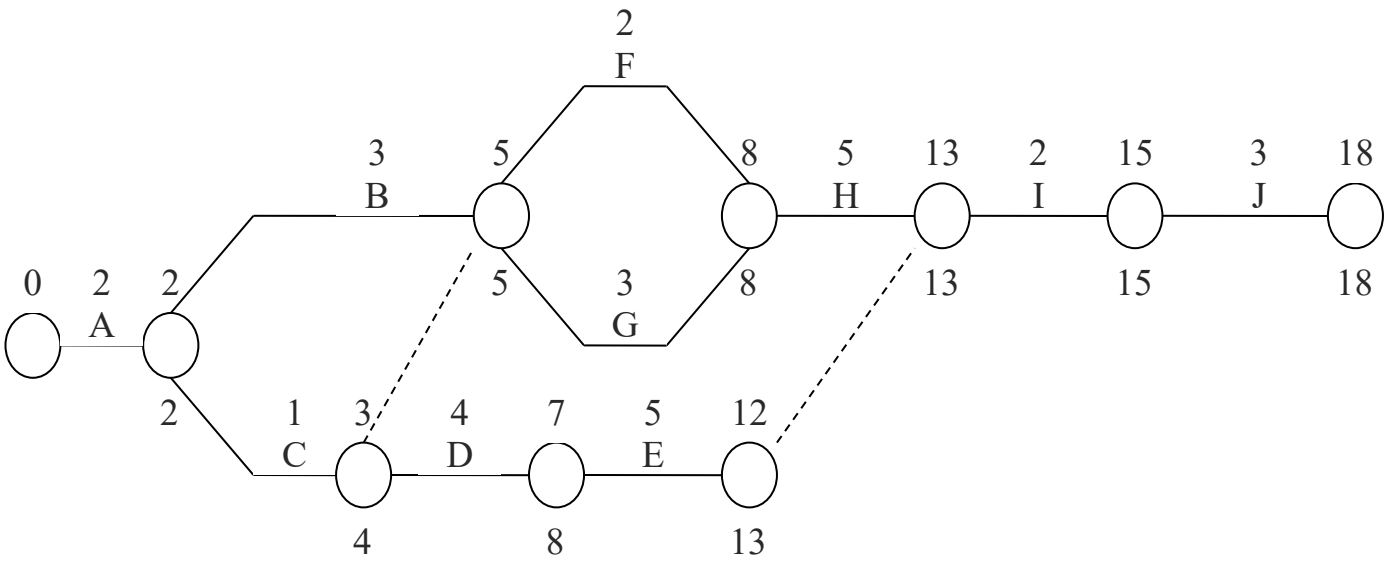


Exercise 7 – Activity on Arrow

Activity	Durations (Days)	Resources used	Preceding Activity
A	2	Machine A	-
B	3	Machine B	A
C	1	Machine C	A
D	4	Machine D	C
E	5	Machine A	D
F	2	Machine E	B
G	3	Machine C	B
H	5	Machine B	F,G
I	2	Machine A	H
J	3	Machine E	E,I

- *If the cost per day is **£2000**, what is the overall cost of the project? Could activity **E** be increased by 2 days and have no affect on the duration of the project? What is the most that activity **D** can be increased by to have no affect on the overall duration of the project*

Solution

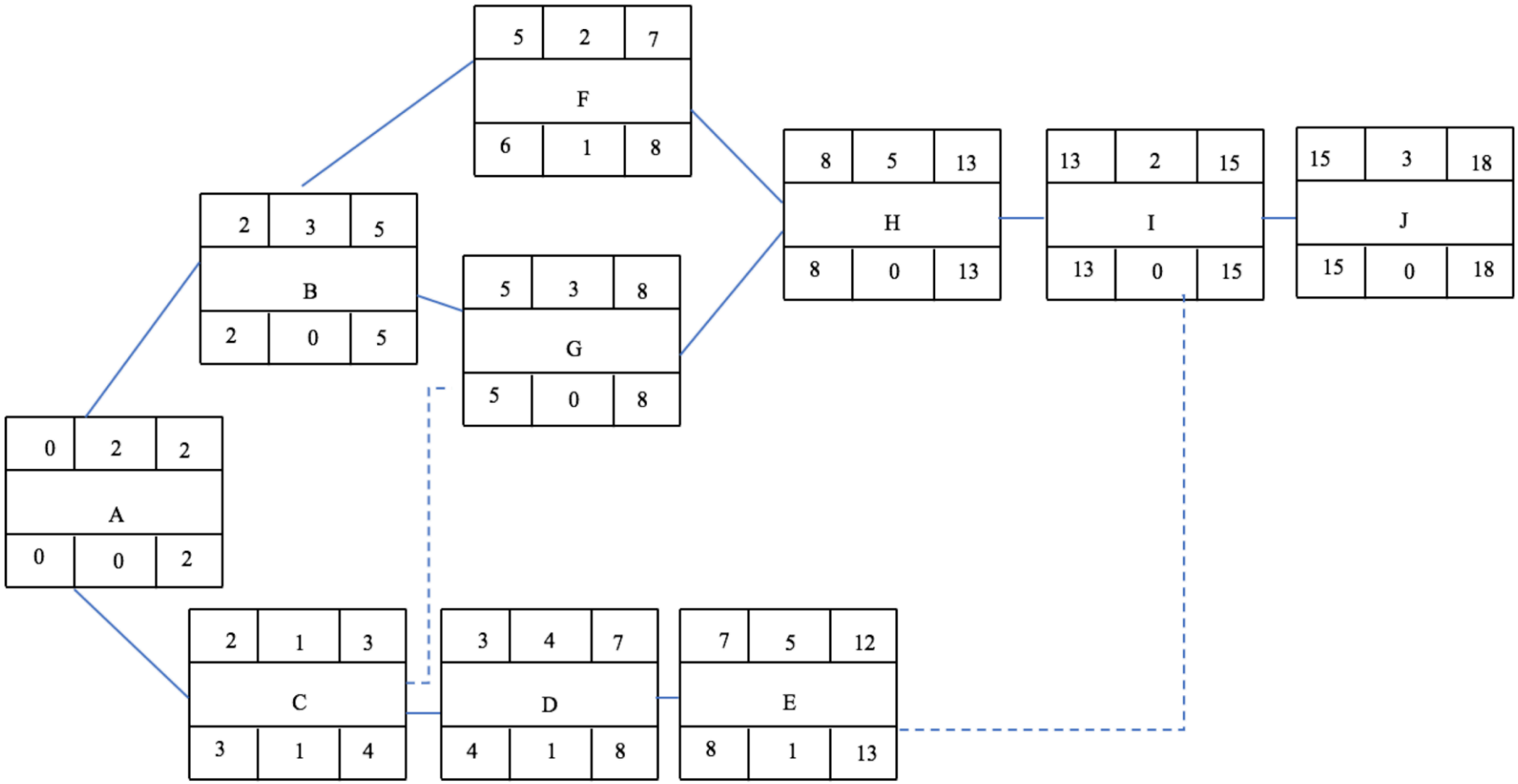


- Critical path: A B G H I J.
- C and G both use machine C, therefore dummy dependency required: similarly I and E with machine A. NB B and H, and F and J also have dependencies, but there is no
- need for a dummy as a dependent path already exists for these.
- NB a GANTT chart would help to show these dependencies as they would overlap.
- Cost: 36,000 (18 duration).
- If E+2, NO! (however E+1 would be OK – again, the dummy and the resource issue).
- D similarly, 1.

Exercise 7

- Change it to activity on node

Solution


5 2 7
F
6 1 8
2 3 5
B
2 0 5
5 3 8
G
5 0 8
0 2 2
A
0 0 2
2 1 3
C
3 1 4
3 4 7
D
4 1 8
7 5 12
E
8 1 13
8 5 13
H
8 0 13
13 2 15
I
13 0 15
15 3 18
J
15 0 18

Total Float (Slack) and Free Float (Slack)

- Total Float = Total float is the amount of time an activity can be delayed **without delaying the project completion date. On a critical path, the total float is zero.**

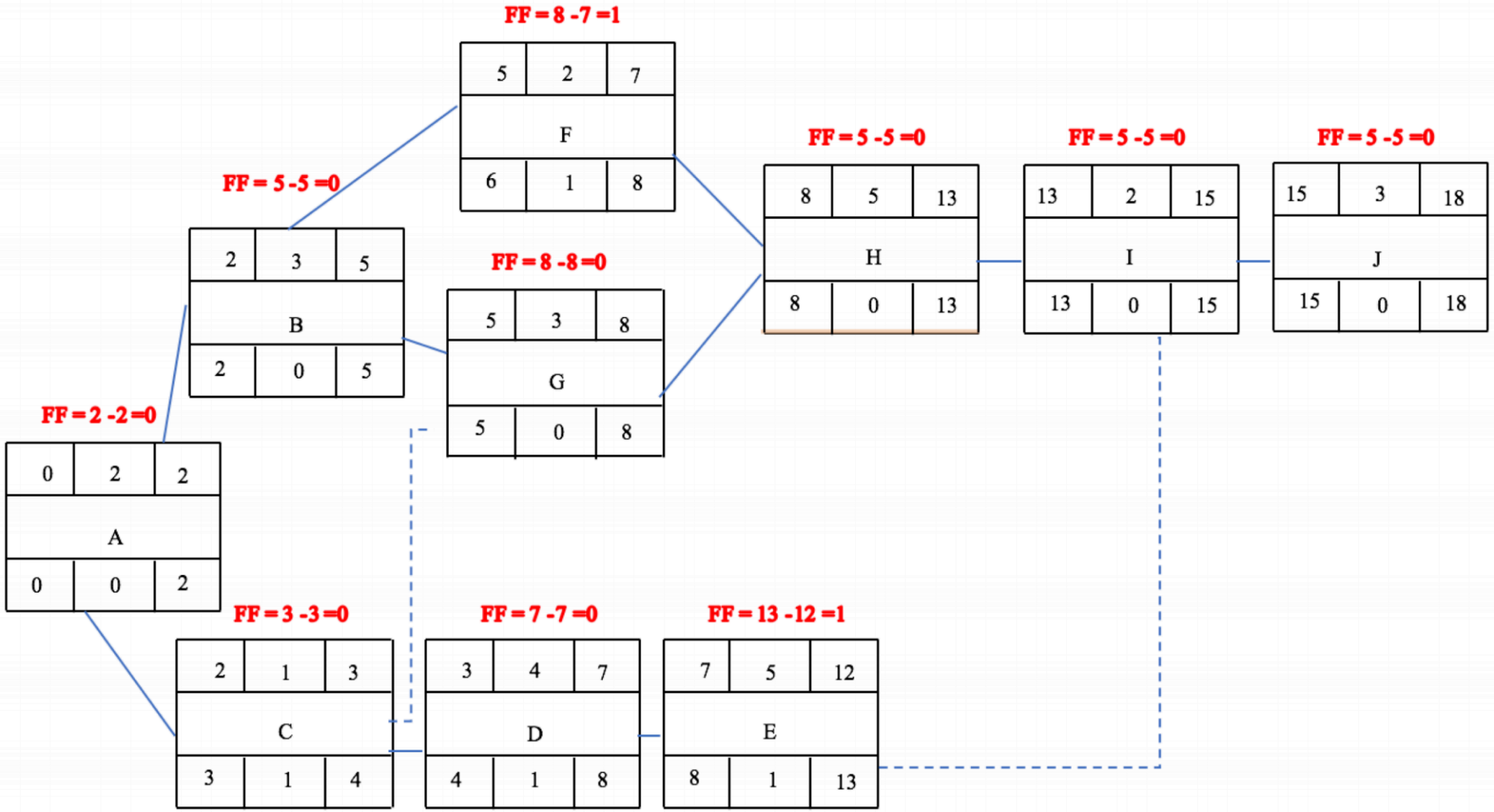
  Total Float = Late Finish date – Early Finish date

- Free Float = Free float is the amount of time an activity can be delayed **without delaying the Early Start of its successor activity.**

  Free Float = ES of next Activity – EF of current Activity

- **Smallest ES of next Activity in case there are more than one successor activities**

Solution


FF = 8 -7 =1
5 2 7
F
6 1 8
FF = 5 -5 =0
2 3 5
B
2 0 5
FF = 8 -8 =0
5 3 8
G
5 0 8
FF = 2 -2 =0
0 2 2
A
0 0 2
FF = 5 -5 =0
8 5 13
H
8 0 13
FF = 5 -5 =0
13 2 15
I
13 0 15
FF = 5 -5 =0
15 3 18
J
15 0 18
FF = 3 -3 =0
2 1 3
C
3 1 4
FF = 7 -7 =0
3 4 7
D
4 1 8
FF = 13 -12 =1
7 5 12
E
8 1 13