Assumptions:
- Activities are continuous
- Start Date <==> Finish Date

$$EFD_I = ESD_I + T_I$$

$$LSD_I = LFD_I - T_I$$

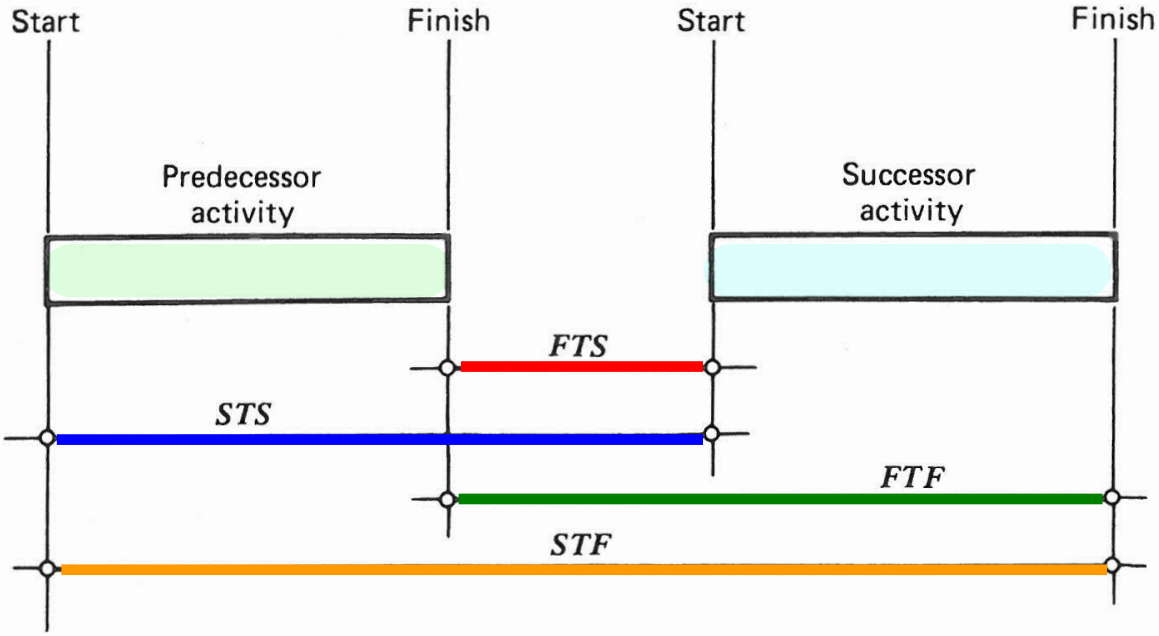
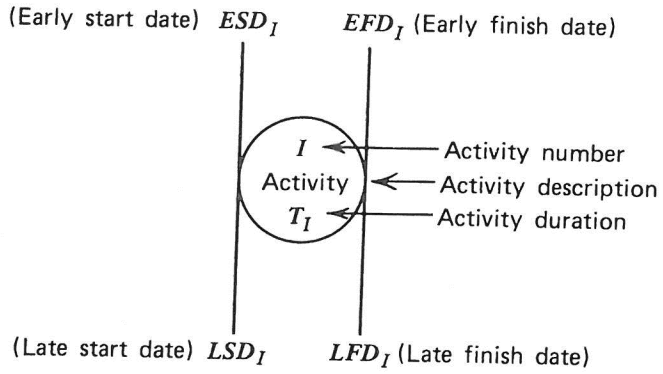
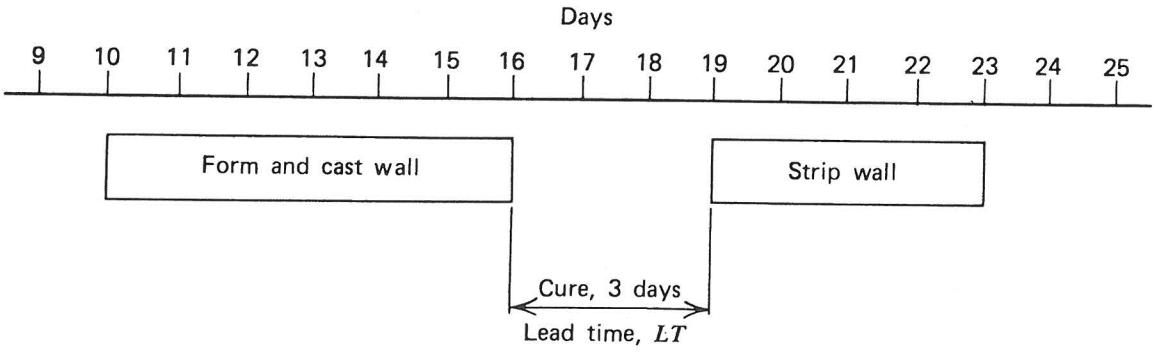


Figure 13.1 The four-link relationships for overlapping networks.

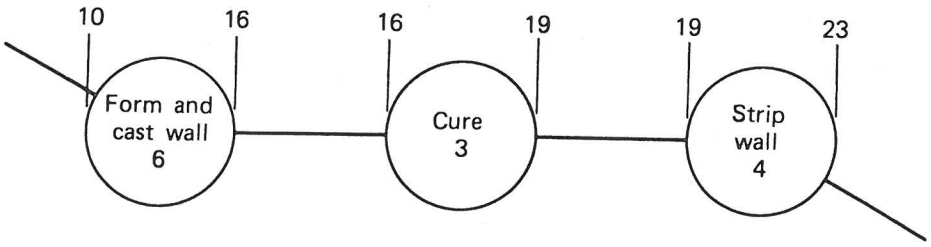


$$EFD_I = ESD_I + T_I$$
$$LSD_I = LFD_I - T_I$$

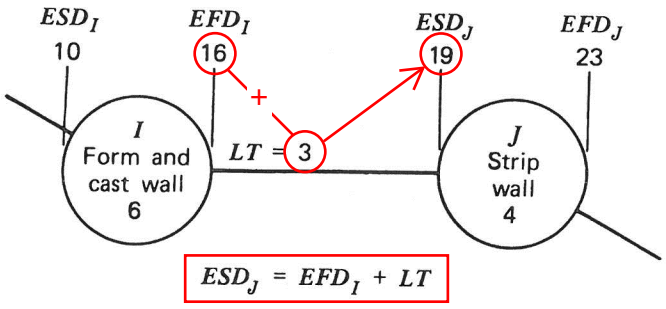
Figure 13.2 Early and late start and finish values for an activity.



(a) Bar chart

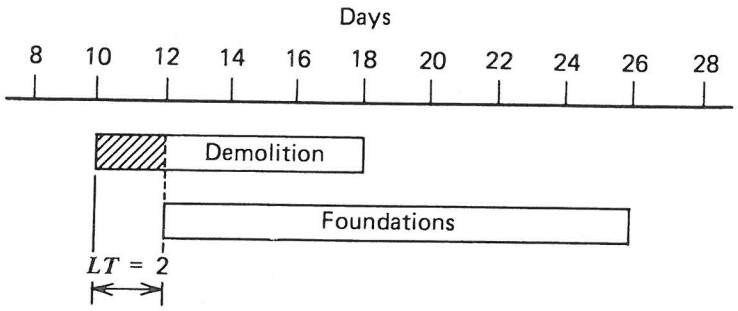


(b) Single relationship model (Chapter 7)

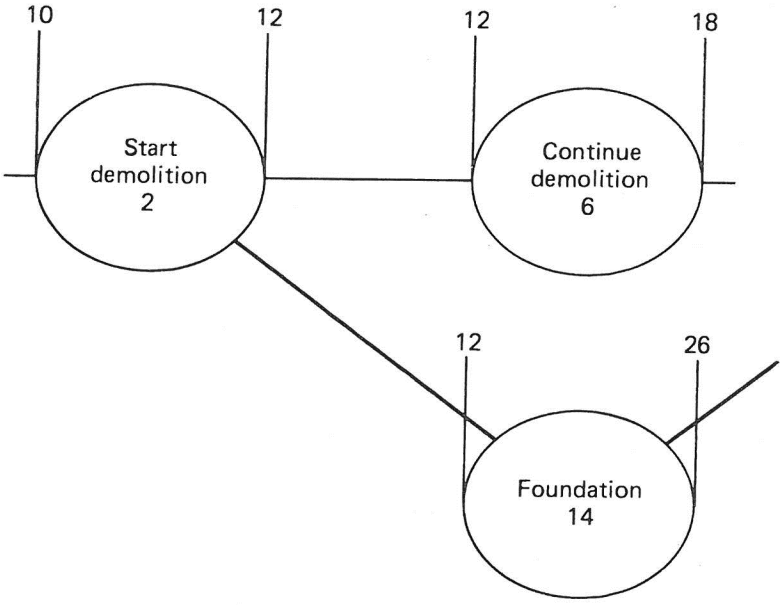


(c) Overlapping model

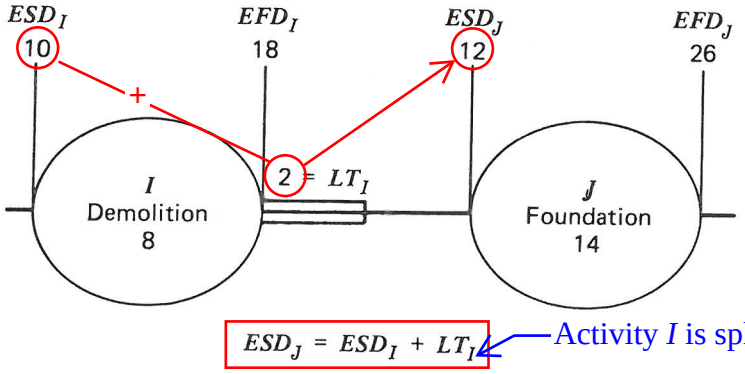
Figure 13.3 Example of finish to start relationship.



(a) Bar chart

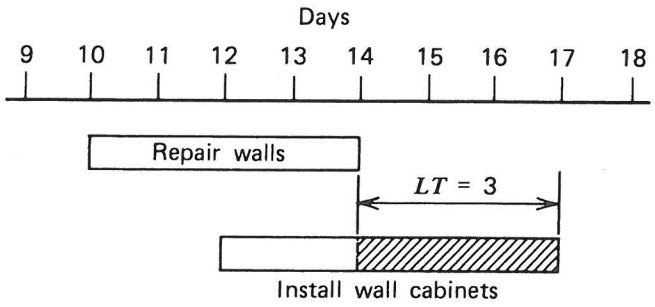


(b) Single relationship model

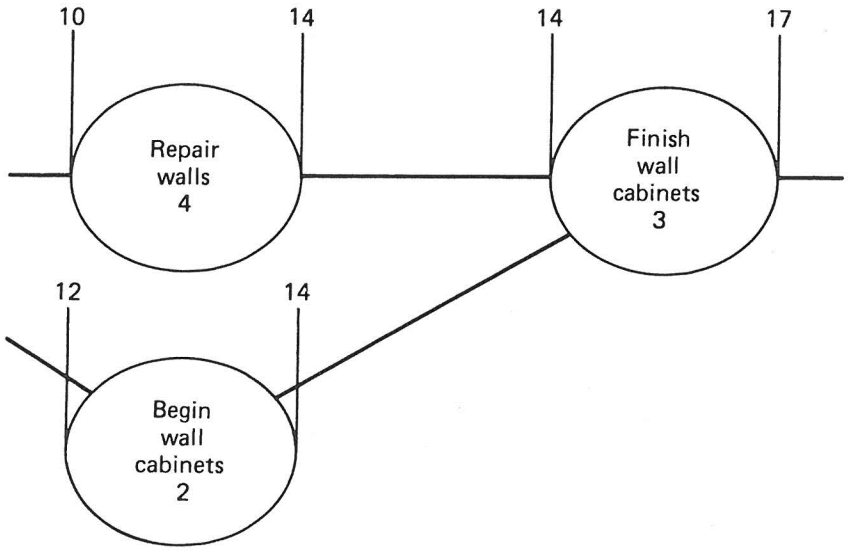


(c) Overlapping model

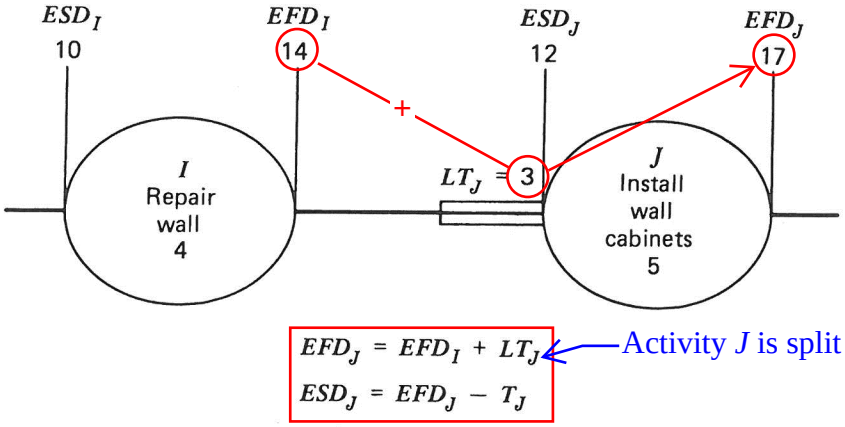
Figure 13.4 Example of start to start relationship.



(a) Bar chart

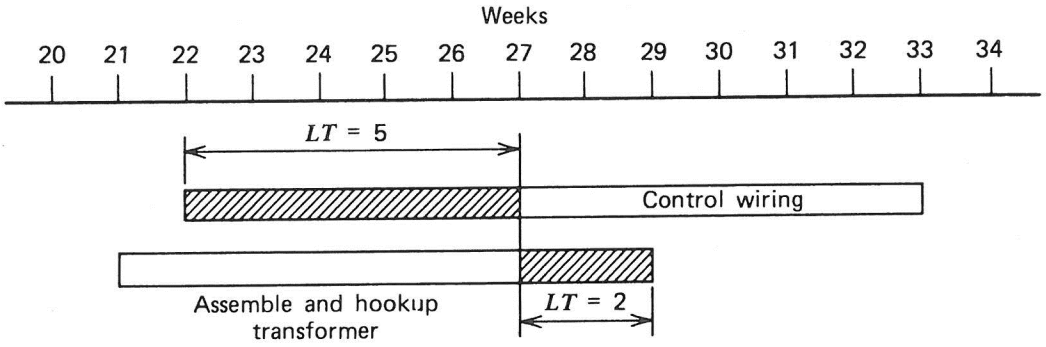


(b) Single relationship model

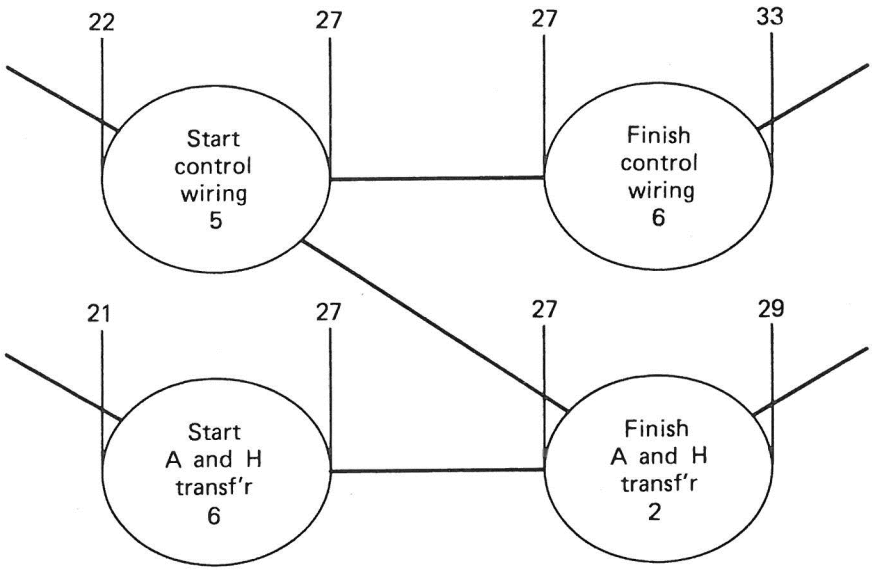


(c) Overlapping model

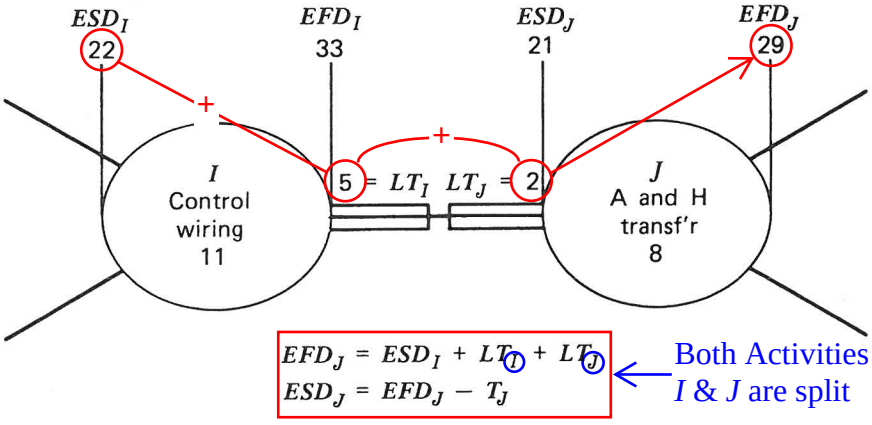
Figure 13.5 Example of finish to finish relationship.



(a) Bar chart

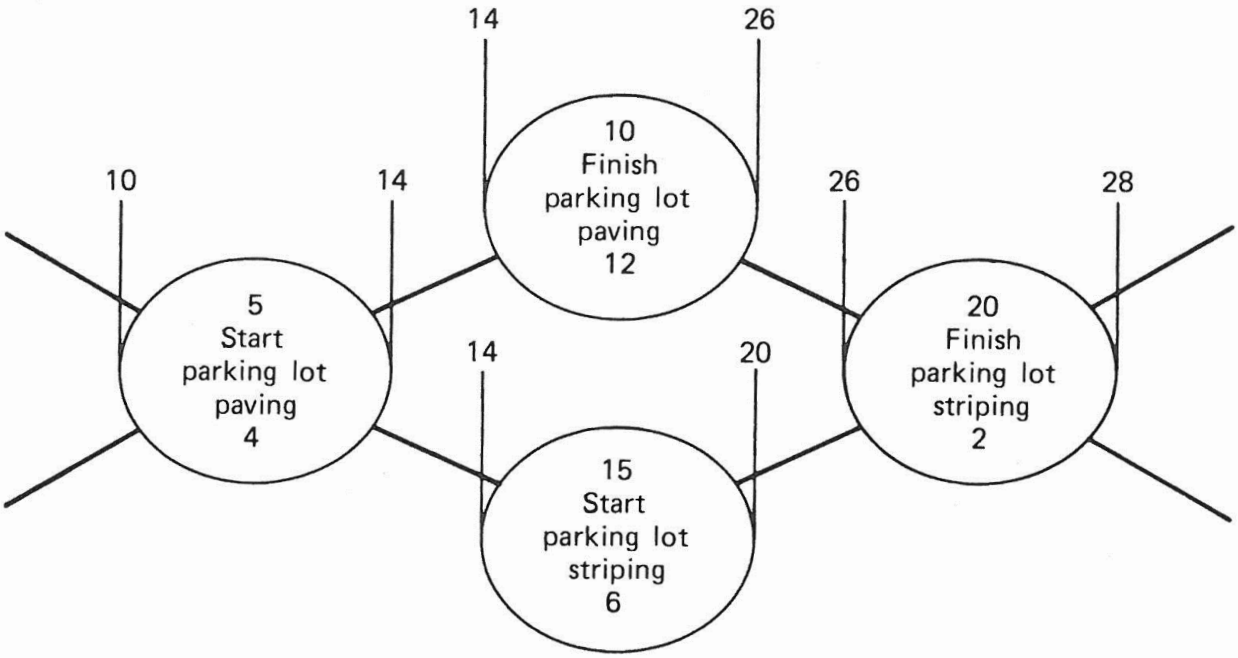


(b) Single relationship model



(c) Overlapping model

Figure 13.6 Example of start to finish relationship.

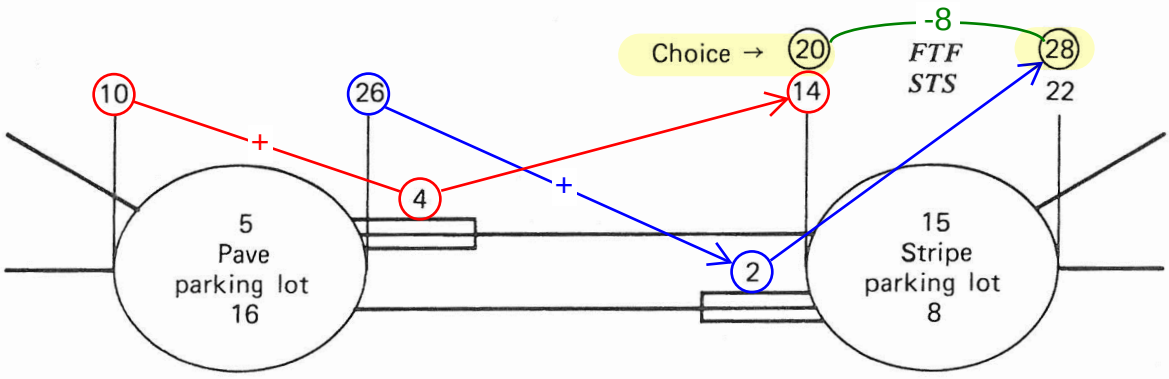


(a)

No.	Activity Description
5	Start parking lot paving
10	Finish parking lot paving
15	Start parking lot striping
20	Finish parking lot striping

(b)

Figure 13.7 ***Compound relationship in a single relationship network.***



(a)

No.	Activity Description	Days
5	Pave parking lot	LT = 4 (STS); LT = 2
15	Stripe parking lot	(FTF)

10 12 14 16 18 20 22 24 26 28

(b)

Figure 13.8 Compound relationship in an overlapping network.

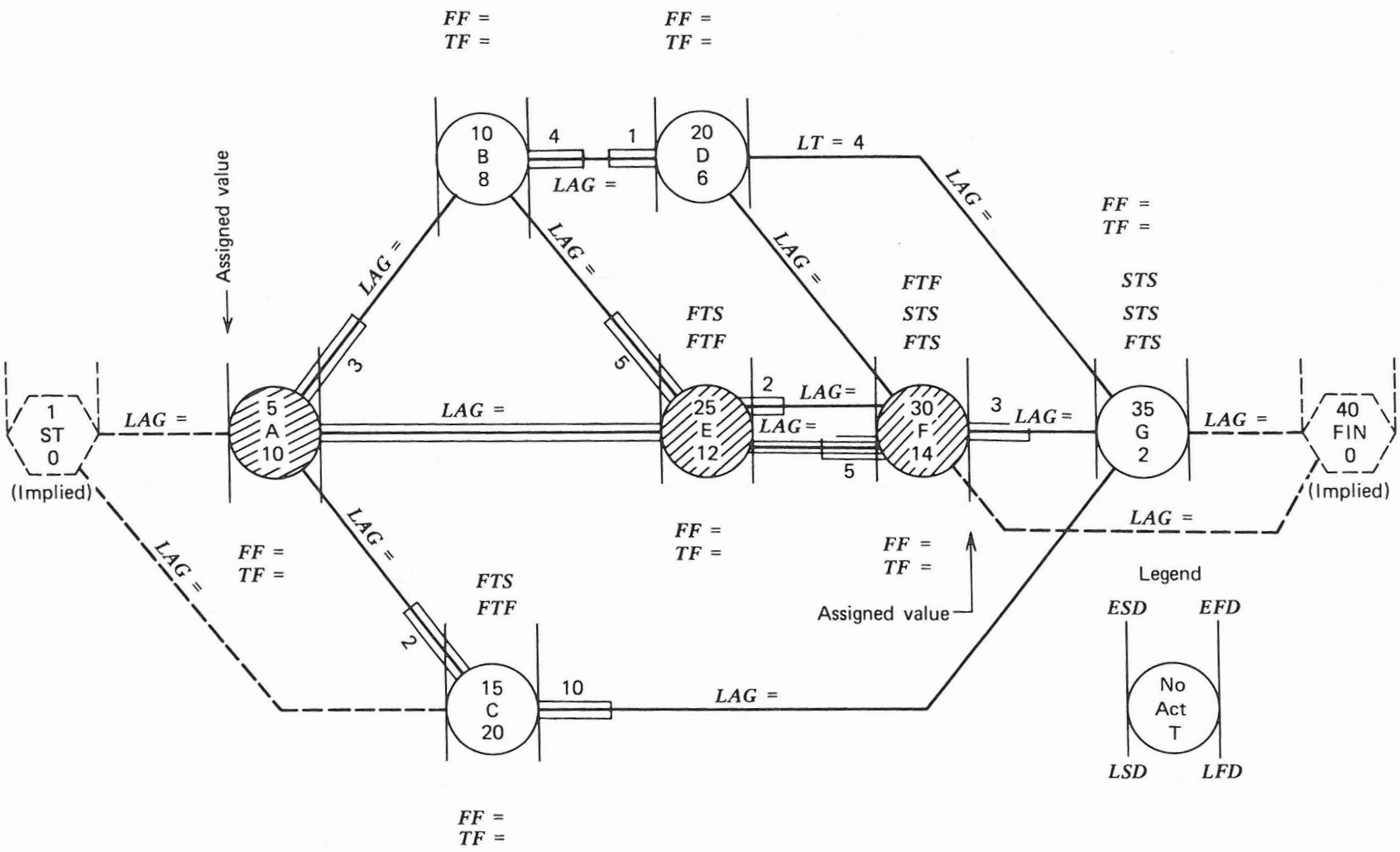
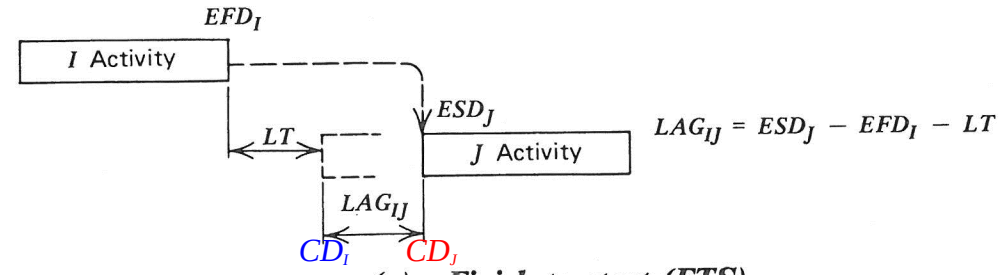


Figure 13.9 Overlapping network computations.

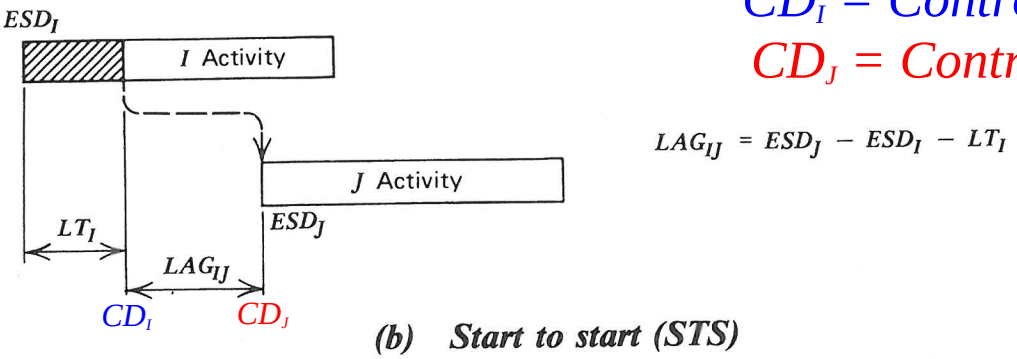


(a) Finish to start (FTS)

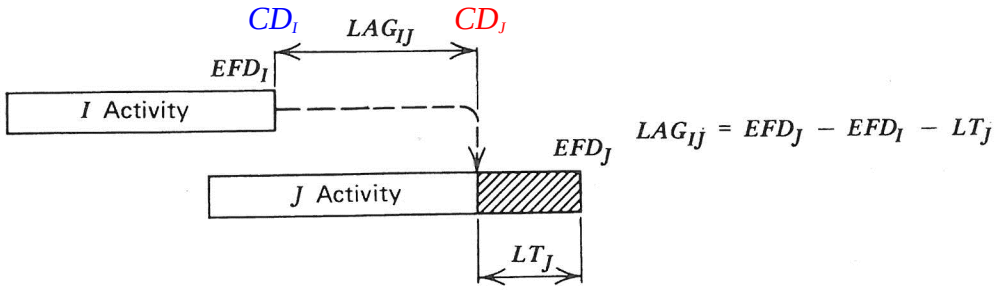
$LAG_{IJ} = CD_J - CD_I$

CD_I = Controlling Date of I

CD_J = Controlled Date of J



(b) Start to start (STS)

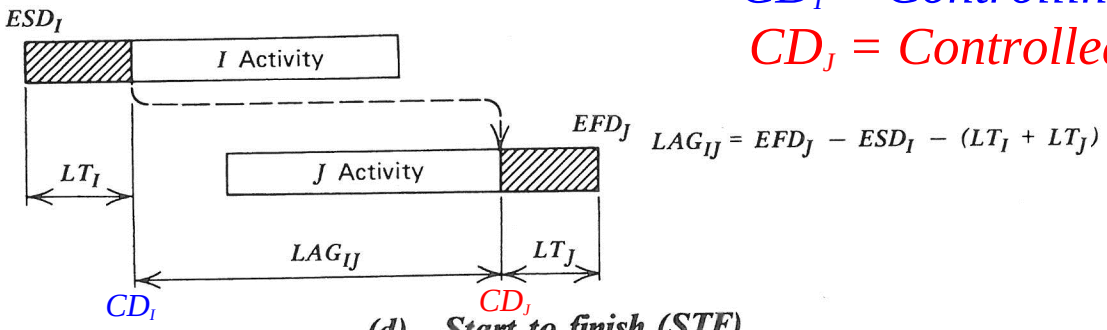


(c) Finish to finish (FTF)

$LAG_{IJ} = CD_J - CD_I$

CD_I = Controlling Date of I

CD_J = Controlled Date of J



(d) Start to finish (STF)

Figure 13.10 Link lag relationships.

FREE FLOAT

The time span in which the completion of the controlling date of an activity may occur and not delay the early status of any successor.

$$FF_I = \left[\begin{array}{c}\text{Minimum early status}\\ \text{of Activities } J.\end{array}\right] - \left[\begin{array}{c}\text{Early controlling date}\\ \text{of Activity } I.\end{array}\right]$$

$$FF_I = \underset{\forall J}{\text{Min}} \begin{bmatrix} ESD_J, \\ EFD_J - LT_J \end{bmatrix} - \begin{bmatrix} EFD_I, \\ EFD_I + LT, \\ ESD_I + LT_I \end{bmatrix}$$

⟵ Typo in textbook

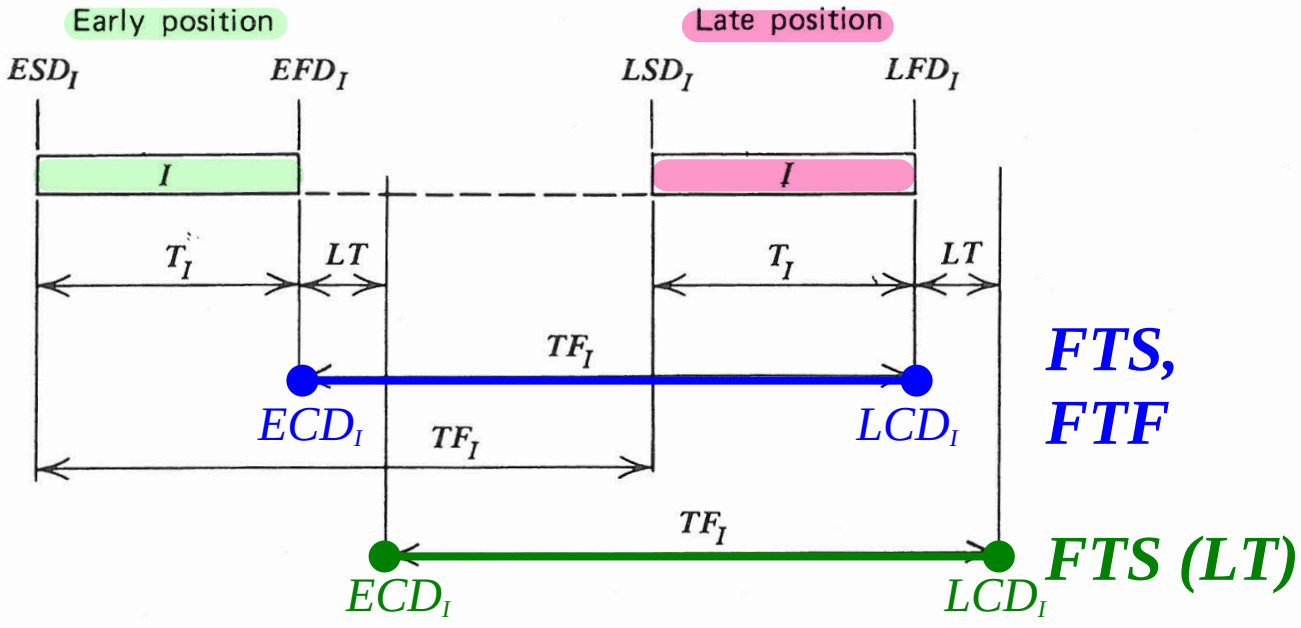
$$FF_I = \underset{\forall J}{\text{Min}} \begin{bmatrix} ESD_J - EFD_I - LT & \Rightarrow FTS \\ ESD_J - ESD_I - LT_I & \Rightarrow STS \\ EFD_J - EFD_I - LT_J & \Rightarrow FTF \\ EFD_J - ESD_I - (LT_I + LT_J) & \Rightarrow STF \end{bmatrix}$$

$$FF_I = \min_J (CD_J - CD_I) = \min_J LAG_{IJ}$$

$$FF_I = \underset{\forall J}{\text{Min}}\, LAG_{IJ}$$

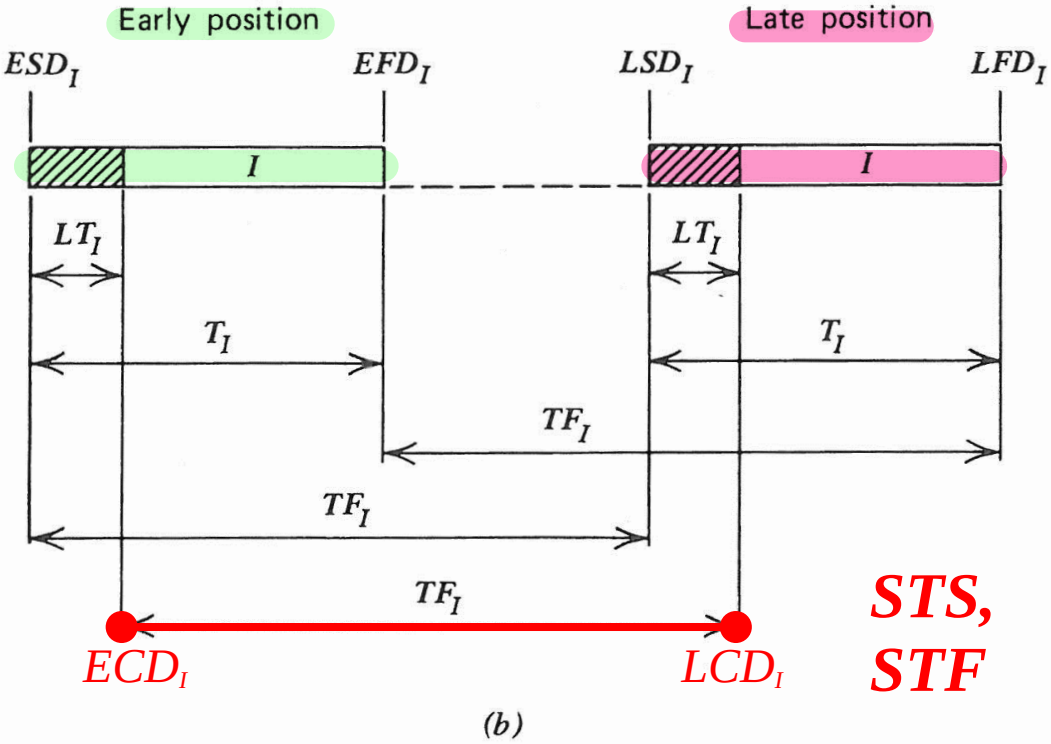
Special cases:
- Activity 35 (follows the true terminal activity)
- Activities 15,20 (linked to activity 35)

Easiest solution:
- Consider the implied terminal activity 40.



(a)

In all cases:
TF_I = Late - Early Controlling Date of I
TF_I = LCD_I - ECD_I



(b)

Figure 13.11 Total float relationships.

TOTAL FLOAT

The time span in which the completion of the controlling date of an activity may occur and not delay the end of the project.

$$TF_I = \left[\begin{array}{c}\text{Minimum late controlling} \\ \text{date of Activities } J\end{array}\right] - \left[\begin{array}{c}\text{Early controlling date} \\ \text{of Activity } I\end{array}\right]$$

$$TF_I = \underset{\forall J}{\text{Min}}\, LCD_J - ECD_I$$

$$TF_I = \underset{\forall J}{\text{Min}}\,(ECD_J + TF_J) - ECD_I$$

$$TF_I = \underset{\forall J}{\text{Min}}\,((ECD_J - ECD_I) + TF_J)$$

$$TF_I = \underset{\forall J}{\text{Min}}\left[\left[\begin{array}{ll} ESD_J - EFD_I - LT & \Rightarrow FTS \\ ESD_J - ESD_I - LT_I & \Rightarrow STS \\ EFD_J - EFD_I - LT_J & \Rightarrow FTF \\ EFD_J - ESD_I - (LT_I + LT_J) & \Rightarrow STF \end{array}\right] + TF_j\right]$$

$$TF_I = \underset{\forall J}{\text{Min}}\,(LAG_{IJ} + TF_J)$$

Special cases:

- Terminal Activity must have its TF assigned
- Activity 35 (follows the true terminal activity)
- Activities 15,20 (linked to activity 35)

Easiest solution:

- Consider the implied terminal activity 40.

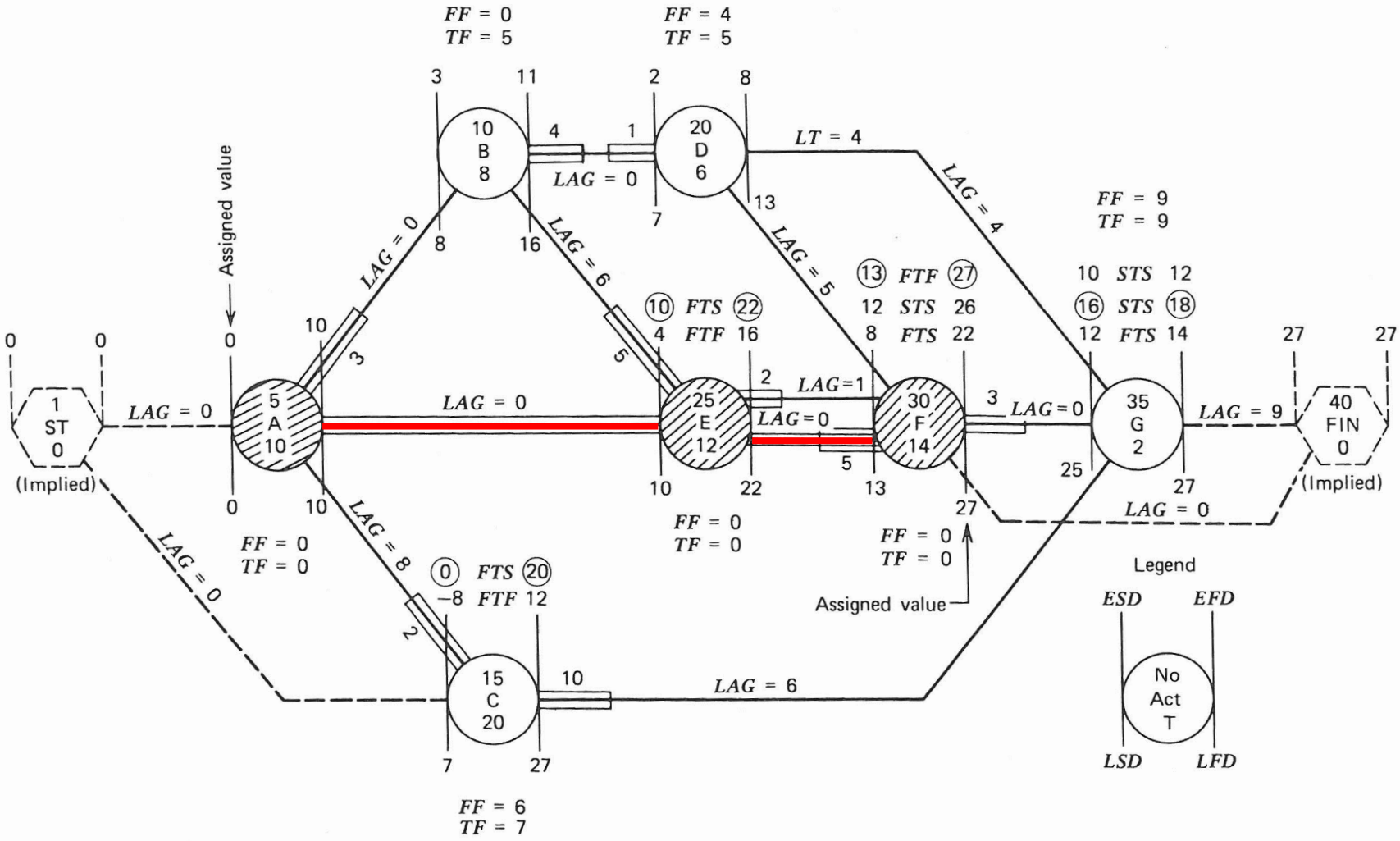


Figure 13.9 Overlapping network computations.

LINK REDUNDANCY

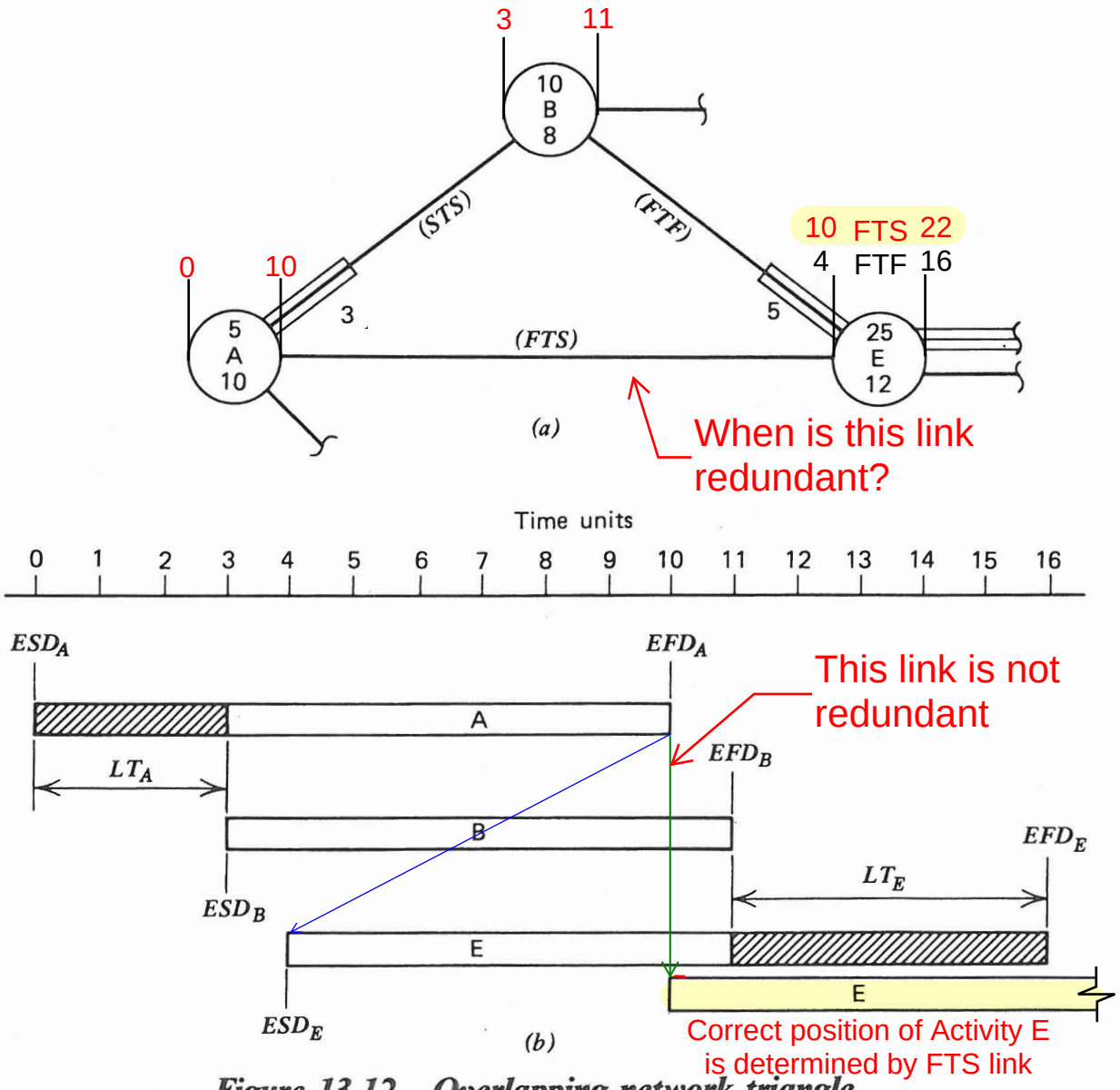


Figure 13.12 Overlapping network triangle.

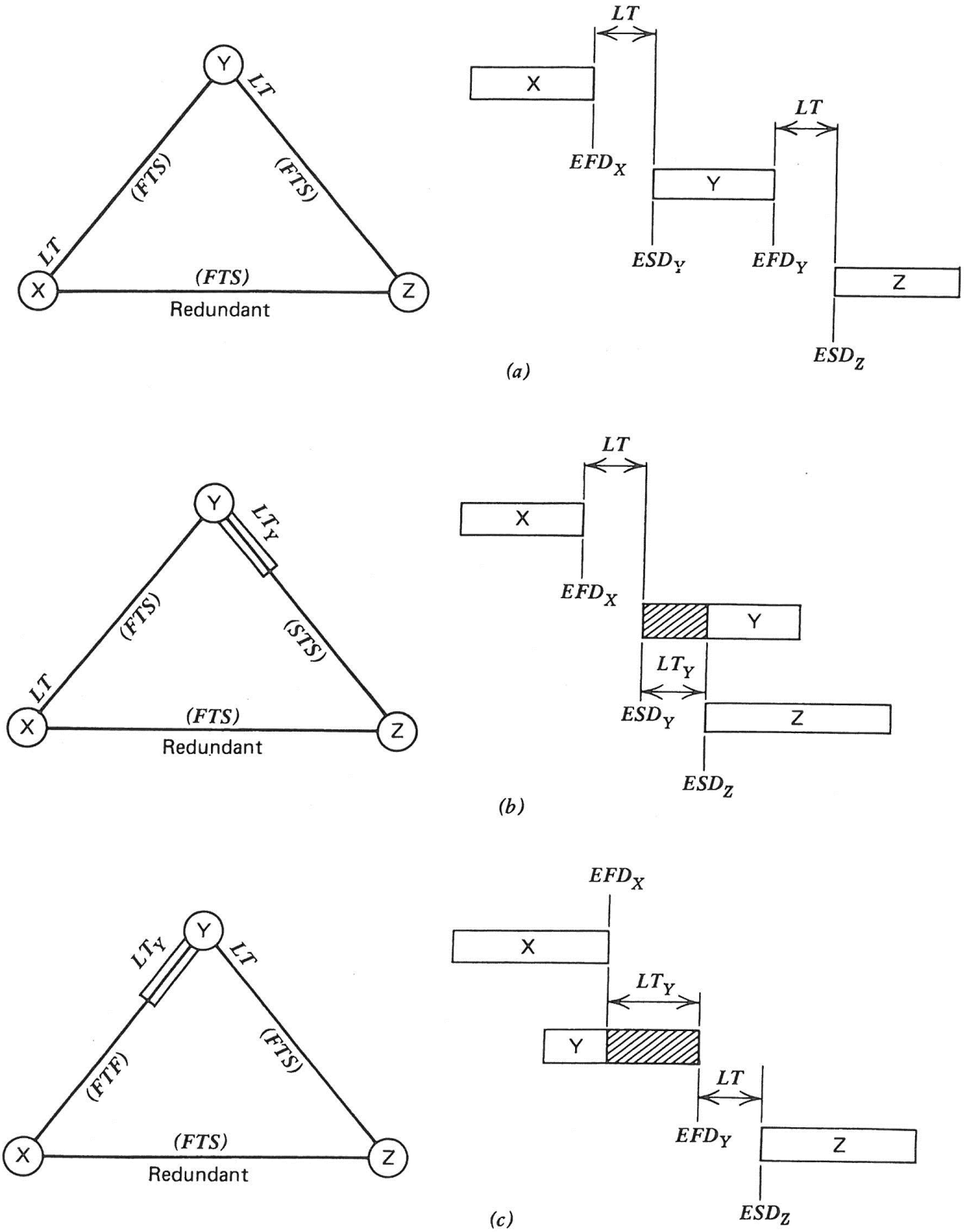


Figure 13.13 The three conditions of redundancy in overlapping networks.

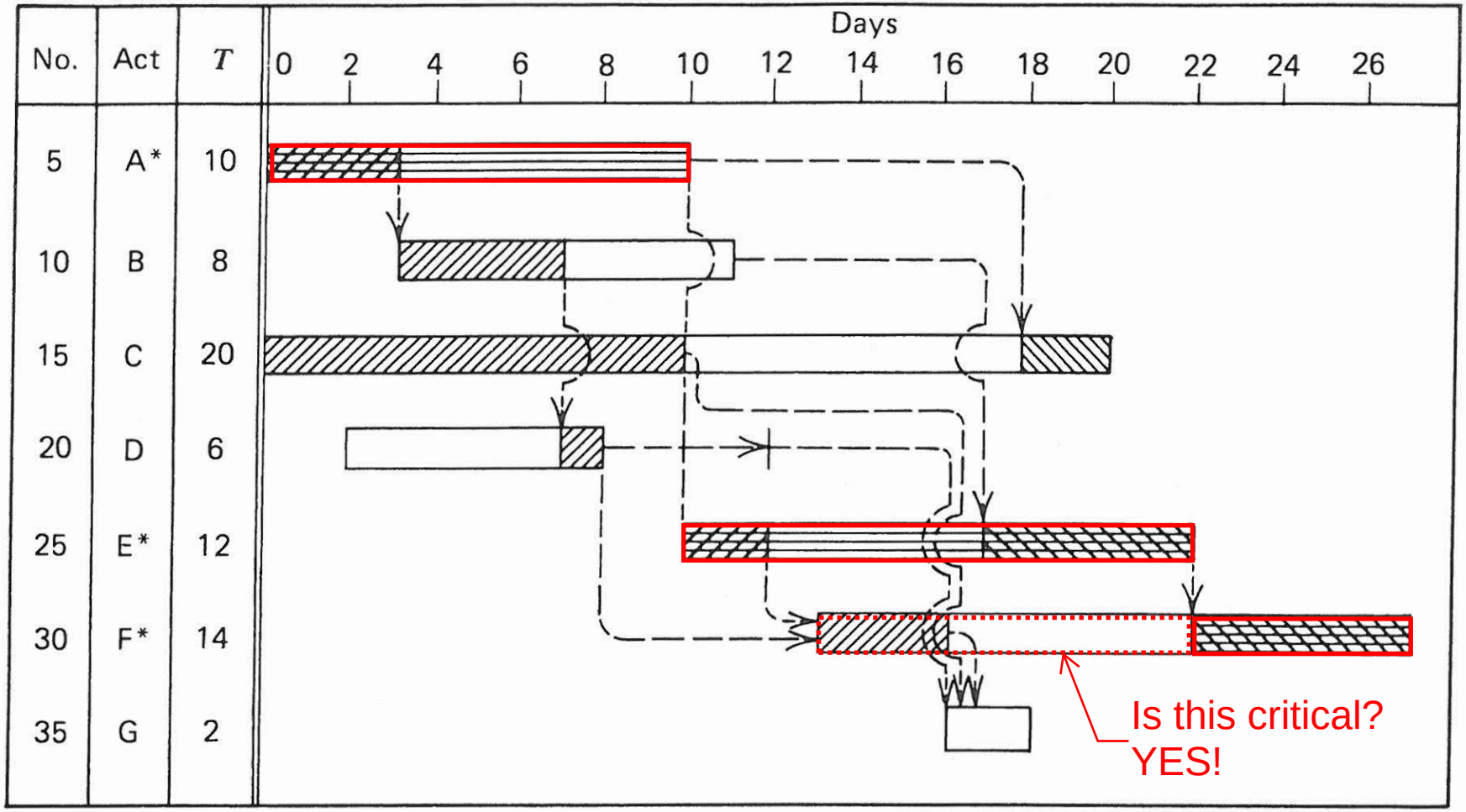
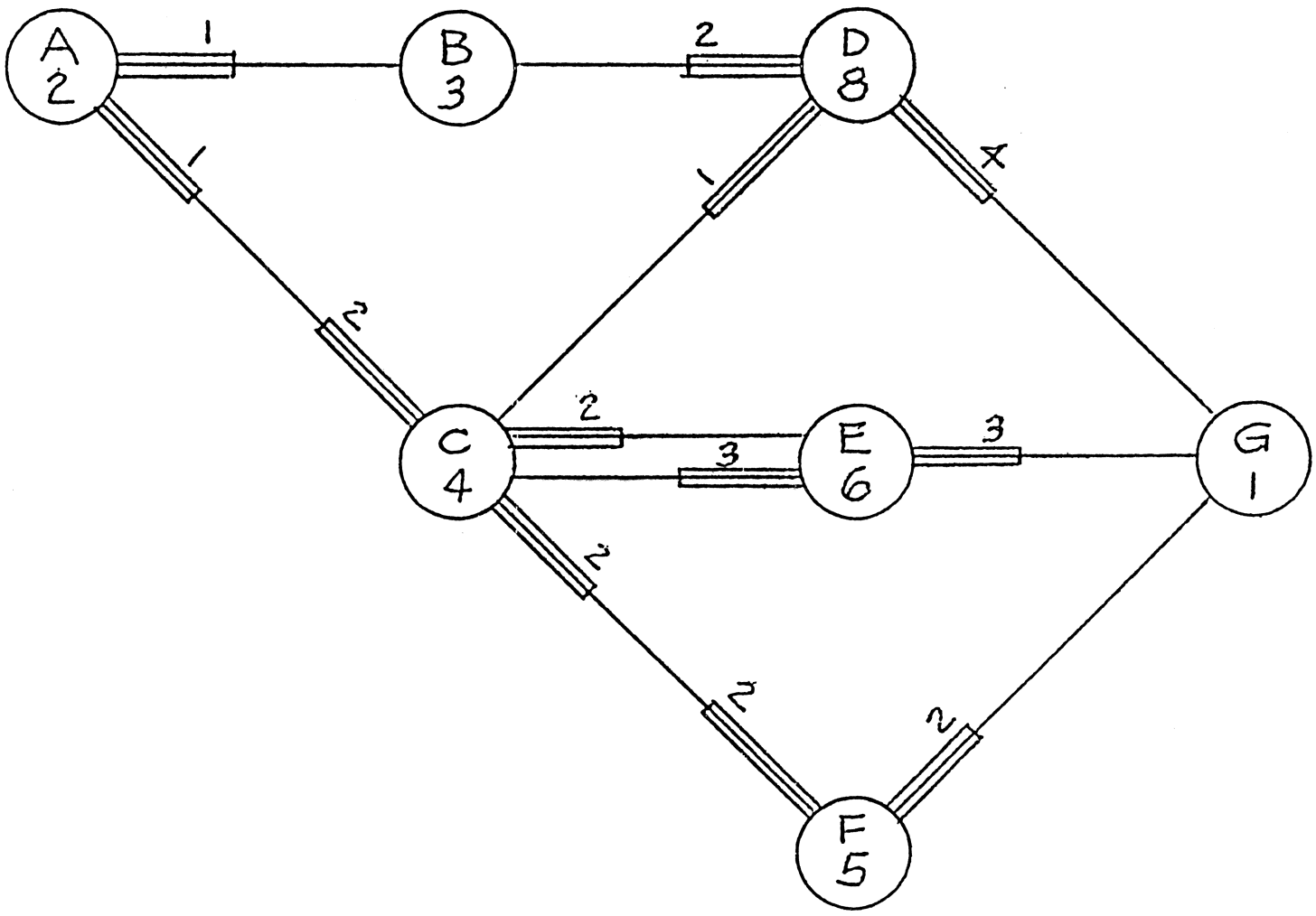


Figure 13.14 Overlapping network bar chart.


A
2
B
3
D
8
C
4
E
6
G
1
F
5
1
2
1
1
4
2
2
3
3
2
2
2

Problem 6 (20 points)

For the overlapping precedence network shown below find the missing **link lags, the free floats, the total floats and the critical path (ONLY).** Assume Activity K determines the true project duration.

Hint: Do not try to find **all** the missing lead times and activity start & finish times to solve the problem. It is possible to determine some but **not all** of these values!

