CHAPTER 14

Switching

14.1 REVIEW QUESTIONS

1. Virtual circuit switching is more efficient because the segments follow a created route, the links of which might be shared by other connections, while in circuit switching the different segments of a message follow a dedicated path that cannot be shared by other connections.
3. Circuit switching, packet switching, and message switching
5. A crosspoint is a microswitch at the junction of an input and an output line in a crossbar switch.
7. In a single crossbar switch, every combination of input and output has its own individual crosspoint. Therefore blocking does not occur.
9. In a space-division switch, the path from one device to another is spatially separate from other paths. The inputs and the outputs are connected using a grid of electronic microswitches. In a time-division switch, the inputs are divided in time using TDM. A control unit sends the input to the correct output device.
11. A TSI consists of RAM with several memory locations. The size of each location is equal to the size of a single time slot (TDM). There are as many locations as input devices. The RAM fills up with incoming data from the time slot in the order received. The control unit in the TSI sends out the slots to the correct output device. In a TDM bus, the input and output lines are connected to a high-speed bus through input and output gates. The control unit opens and closes the gates according to switching needed.
13. Space division is instantaneous, which means there are no delays when processing a connection.
15. Regional offices, sectional offices, primary offices, toll offices, and end offices
17. Circuit switching means creating a dedicated physical connection between two end devices. Packet switching means dividing the data into possibly variable length packets and sending them through possibly different paths to the destination.

19. Each packet is treated independently from the others. Each packet may go a different path to reach the destination. This might cause packets arriving out of order.
21. A virtual circuit is created first and then all three packets of the message travel the same route.

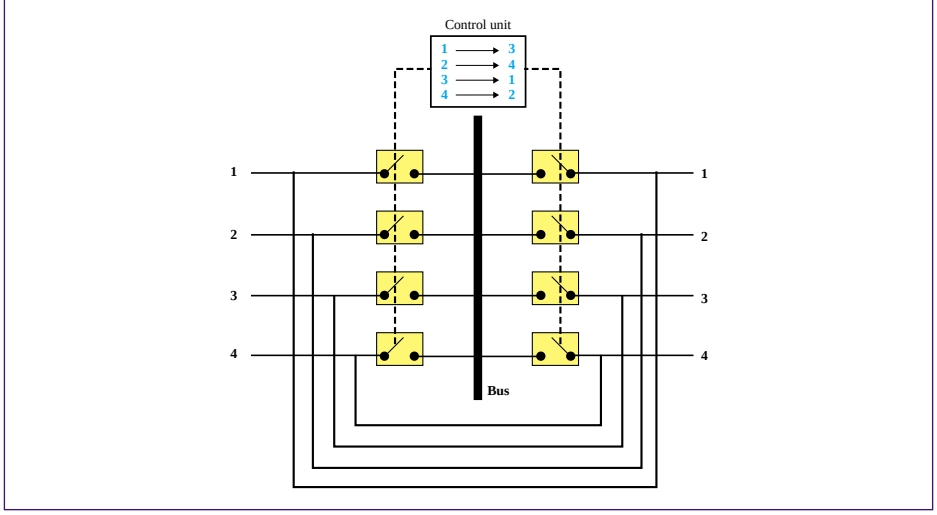
14.2 MULTIPLE CHOICE QUESTIONS

23. a 25. c 27. b 29. b 31. a 33. b 35. d 37. b

14.3 EXERCISES

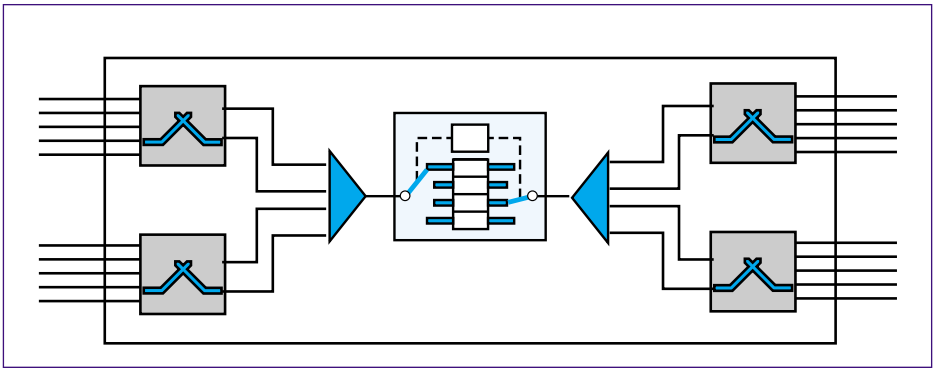
39. 168 crosspoints
41. Efficiency is improved by 58%.
43. Yes, more second stage switches allow more output lines at the first-stage switches, which requires more crosspoints. The more crosspoints, the less blocking.
45. $2\ (N \times L) + K^2 \times L$
47. Figure 14.1 shows one solution.

Figure 14.1 *Exercise 47*



49. Figure 14.2 shows one solution.

Figure 14.2 *Exercise 49*



51. See Table 14.1.

Table 14.1 *Exercise 51*

Issue	*Circuit-switched*	*Packet-switched*
Dedicated path	Yes	No
Store and forward	No	No
Need for connection establishment	Yes	No and yes
Routing table	No	Yes
Delay	No	Yes

53. See Table 14.2.

Table 14.2 *Exercise 53*

Issue	*PVC*	*SVC*
Connection and disconnection	No	Yes
Payment	Pay per month	Pay per connection
Table lookup	No	Yes
Duration of an entry in a table	Permanent	Temporary