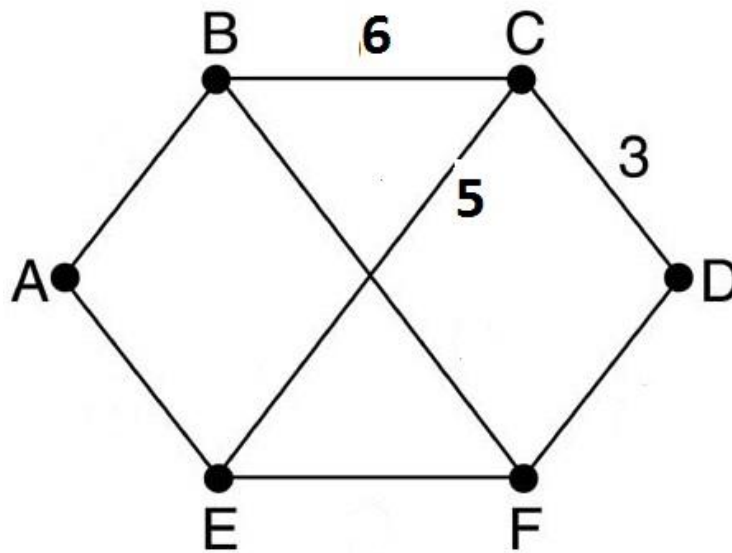


The Network Layer and the IP protocol

1. *Datagram subnets route each packet as a separate unit, independent of all others. Virtual-circuit subnets do not have to do this, since each data packet follows a predetermined route. Does this observation mean that virtual-circuit subnets do not need the capability to route isolated packets from an arbitrary source to an arbitrary destination? Explain your answer.*
2. *Assuming that all routers and hosts are working properly and that all software in both is free of all errors, is there any chance, however small, that a packet will be delivered to the wrong destination?*
3. *Is fragmentation needed in concatenated virtual circuit internets, or only in datagram systems?*
4. *Tunneling through a concatenated virtual circuit subnet is straightforward: the multiprotocol router at one end just set up a virtual circuit to the other end and passes packets through it. Can tunneling also be used in datagram subnet? If so, how?*

5. Consider the subnet of the following figure.



Distance vector routing is used, and the following vectors have just come into router C:

- a. from B: (5, 0, 8, 12, 6, 2);
- b. from D: (16, 12, 6, 0, 9, 10); and
- c. from E: (7, 6, 3, 9, 0, 4).

The measured delays to B, D and E, are **6**, **3**, and **5**, respectively. What is C's new routing table? Give both the outgoing line to use and the expected delay.

6. IPv6 uses 16-byte addresses. If a block of 1 million address is allocated every picosecond ($= 10^{-12}$ sec), how long will the addresses last?