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Ex1

Q1 (R4)

Access technologies include DSL, Cable, and Dial-Up for home access, Ethernet and WiFi for enterprise (and home) access, and 4G LTE for wide-area wireless access.

Q2 (R12)

Circuit-switched network is faster than packet-switched network because resources are reserved. It is faster but more expensive.

Q3 (R23)

Application layer is responsible for protocols like HTTP, SMTP, FTP, and DNS. It works closest to the user and resolves tasks such as messages being displayed and host names. Transport layer transports application-layer messages between application endpoints. Network layer includes IP protocol and it is responsible for providing the service of delivering the segment to the address passed from the transport layer. Link layer routes a datagram through a series of routers and nodes. The physical layer determines how bits are carried through different mediums such as copper wire, coaxial cable, and fiber.

Q4 (P8)

- a.  $3\text{Mbps}/150\text{kbps} = 20$  users
- b. 0.1 because each user transmits only 10 percent of the time.
- c.  $\text{choose}(120, n)(0.1)^n(0.9)^{120-n}$
- d.  $\sum_{i=21, 120} \text{choose}(120, i)(0.1)^i(0.9)^{120-i}$

Q5 (P21)

If the server can only use one path, the maximum throughput is the minimum transmission rates of all the links in that path. If the server can use all M paths, the maximum throughput is the sum of all paths' throughputs, which is determined by the slowest link in that path.