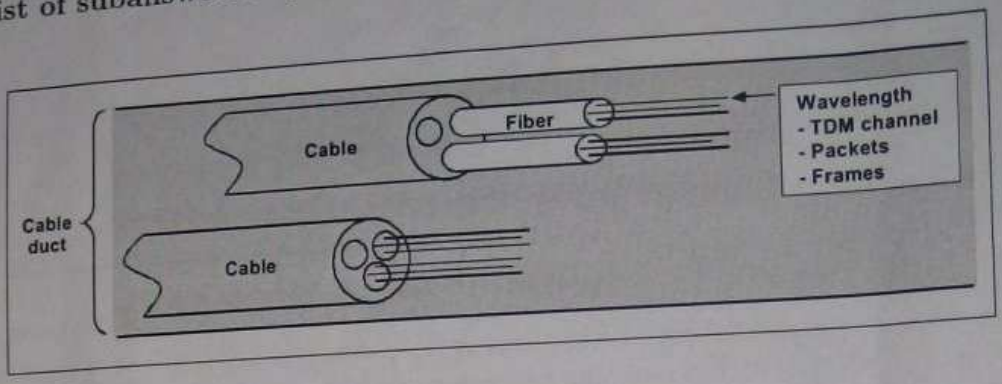
- **Please give short and readable answers.**
- **If not readable, the answer is wrong.**
- **List of subanswers is preferred over long and full sentences.**



Question A1: Optical networking components

1. What types of optical filters are used in communication networks?
2. What types of fibers are used in optical communications?
3. Briefly describe the nonlinear effects occurring in single mode fibers.
4. How does an erbium-doped fiber amplifier (EDFA) operate?
5. How is chromatic dispersion in single mode fibers effectively compensated?
6. How does a acousto-optic switch work?
7. How optical buffers can be implemented?

Question A2: Electronic networking components

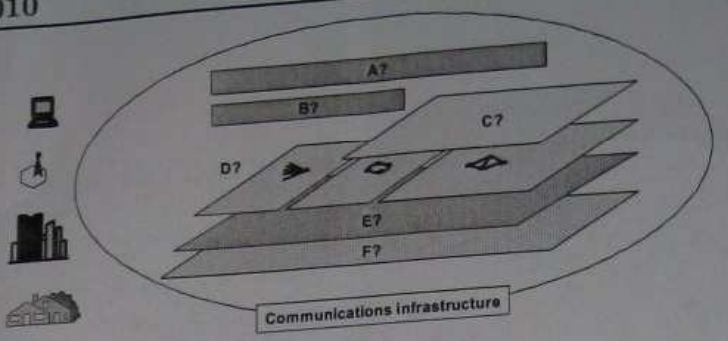
1. What is a ternary CAM and where it is used in networking systems?
2. Which technologies and semiconductor materials are used in telecom ICs?
3. Describe the functional layering of a typical SONET/SDH framer device.

Question A3: Interconnects

1. Describe an interface between asynchronous and synchronous digital circuits.
2. What is the maximum distance possible by using the XAUI interface?
3. Characterize the interfaces of 40 Gigabit and 100 Gigabit Ethernet systems.
4. What are the differences between the four levels of the UTOPIA interface?

Question A4: Systems

1. What is iSCSI?
2. Describe the HyperTransport connections and the device configurations.
3. Which technologies can be used to implement high-capacity backplanes?
4. What coding scheme is used in 10GBASE-R?
5. What is the difference between transparent SAN and IP-SAN?



Question B1: Networking

1. Give the network planes A to F.
2. Give the four QoS categories. What is meant by QoP and QoT on the lower layers?
3. For what purpose a 64-bit IEEE address has been realized? What is its structure?
4. What is the relationship between routing protocols, routing tables and forwarding?
5. Which network components are present in a GSM/GPRS network?
6. Which frame field distinguishes between group members in a VLAN?
7. How is a telephone number translated to an email entry?

Question B2: Circuit-switching

1. How are packets mapped onto synchronous transmission channels?
2. What are the synchronization differences in PDH, SDH, and OTH?
3. What are the packet flow properties over a circuit-switched tunnel?
4. What does virtual concatenation mean in transmission switching?

Question B3: Packet-switching

1. How are ATM cell-boundaries found?
2. Which PDUs are used in TCP? What is the granularity of acknowledgement?
3. Which are the networking layers of IP, Ethernet, frame relay and MPLS?
4. What are the reasons to install a NAT?
5. What is inverse multiplexing and what is the term in Ethernet?

Question B4: Wireless access

1. Which is the duplex mode of WLAN and DECT, respectively?
2. Which transmission structure is used in WiMax and also in LTE?
3. Which physical structure is used in the DECT radio interface?
4. What is the physical structure of the radio interface of GSM/GPRS.
5. Give three categories of wireless media that requires a MAC.

Question B5: Wired access

1. Which transmission principle and which data formating structure is used in ADSL?
2. What is the difference between an access link in PSTN and ISDN?
3. Which access technology uses the standard DOCSIS?
4. Which duplex mechanisms can be used on a twisted copper-pair?