Do not award half marks.
In all cases give credit for appropriate alternative answers.

Question 1 (Compulsory)

(a)   Name the *four* major services provided by network components?   [4]

Transmission   **[1]**
Switching   **[1]**
Signaling   **[1]**
Network Management   **[1]**

(b)   What is the unit of measurement for signals?   [1]

Baud   **[1]**

(c)   Explain and provide an example of a simplex transmission.   [2]

Flow of information is in one direction only.   **[1]**
Radio broadcast   **[1]**

(d)   Describe the mechanical specification of the RS232-C interface.   [3]

It has a 25 pin connector   **[1]**
The pins are organized in 2 rows.   **[1]**
Pins 1 to 13 are in the top row and pins 14-25 are in the second row. **[1]**

(e)   What is the frequency range of the user channel in the telephone network?   [2]

300Hz to 3300Hz   **[2]**

(f)   What is guided media? Give an example of such a media.   [2]

**The medium itself plays an important role in determining the
characteristics of the transmission limitation.**   **[1]**
Example: twisted pair which has a maximum transmission rate   **[1]**

(g)   What are the functions of the protection layers in a fiber optic cable?   [4]

Protect the fiber from extra forces   **[1]**
Protect from moisture   **[1]**
Strengthen the fiber   **[1]**
Prevent penetration of outside material   **[1]**

(h)   What is the main cause of attenuation for microwave transmission?   [1]

Rainfall   **[1]**

(i)   What is the optimum frequency range for satellite transmission? Explain why
        this is so?   [3]

The range is from 1 to 10Ghz   **[1]**
Frequencies below 1Ghz are affected by human made interference   **[1]**
Frequencies above 10Ghz are affected by atmospheric absorption   **[1]**

(j)   What is meant by delay distortion? How can this problem be overcome?   [4]

The propagation velocity through a guided media varies with frequency   **[1]**
**The velocity tends to be greater near the center and decreases towards
the edges**   **[1]**
causing different components of a signal to arrive at different times   **[1]**
Use an equalizer to equalize the velocity across the band.   **[1]**

(k)   In the context of data communications, explain what is impulse noise.   [2]

Noise spikes of high amplitude.   **[2]**

(l)   Explain the role of a bridge and name the layer it operates on?   [2]

A device that relays frames between LANs   **[1]**
Data-link layer   **[1]**

Do not award half marks.
In all cases give credit for appropriate alternative answers.

Question 2

(a)   Describe the major elements of a LAN.   [4]

Cabling system such as coaxial cables, twisted pairs   [1]
Protocols such as CSMA/CD, etc.   [1]
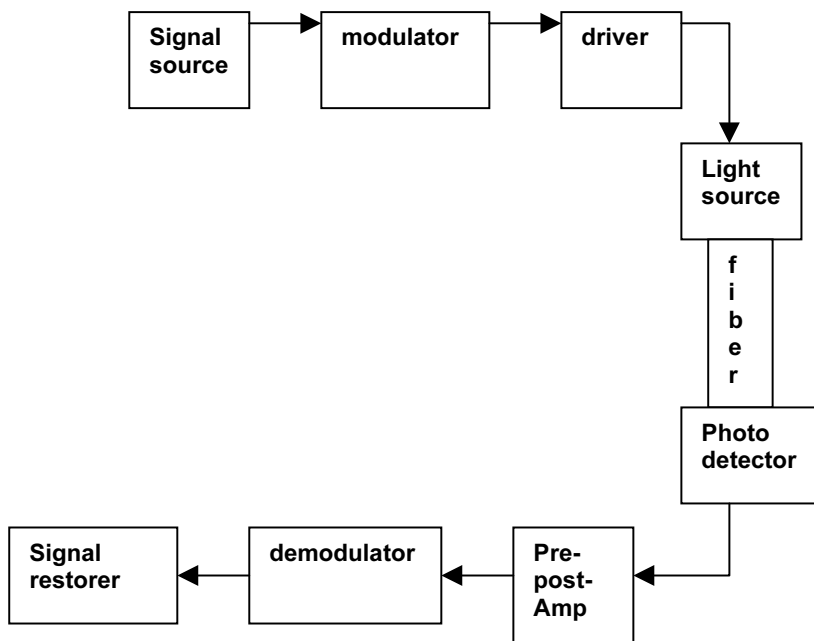**Topologies such as bus, ring, star   [1]**
Interconnection devices such as bridges, gateways.   [1]

(b)   What are the problems associated with the bus/tree topology?   [2]

Difficult access control problems   [1]
Balancing signals varies with the addition or removal of nodes   [1]

(c)   Describe with the aid of a diagram, the components of an optical link.   [8]

Deduct 1 mark for every missing components

(d)   What is a light-emitting diode?   [1]

A semi conductor device that emits light when a voltage is applied.   [1]

Do not award half marks.
In all cases give credit for appropriate alternative answers.

Question 3

(a)   Different computers may have different ways of representing data. Provide *four* such differences. State and define the layer that deals with these differences.   [6]

Character sets: ASCII vs EBCDIC   **[1]**
Integers: binary vs Binary Coded Decimal   **[1]**
Word size: 16 bit vs 32 bit   **[1]**
Bit order: left to right vs right to left   **[1]**
Award marks for other correct differences

Presentation Layer   **[1]**
This layer is responsible for ensuring that information is presented to the eventual user in a meaningful way; or this layer is concerned with the way the data is represented and the data structures employed in the representation; or this layer is concerned only with syntax and not with semantics.
1 mark for anyone of the above three definitions.

(b)   Communication between application processes takes place via entities in the Application layer. Name the *two* classifications of these entities.   [2]

User elements   **[1]**
Application service elements   **[1]**

(c)   Describe *four* functions of the Network layer.   [4]

Routing and relaying   **[1]**
Congestion control   **[1]**
Segmenting and blocking   **[1]**
Error recovery   **[1]**
Flow control   **[1]**
Sequence delivery   **[1]**
Any four of the above

(d)   Describe the role of the transport layer. Give an example of a connectionless transport Protocol.   [3]

The transport layer provides the functions to bridge the gap between the services available from the network layer and those required by the layers above [2]. User-datagram protocol [1].

Do not award half marks.
In all cases give credit for appropriate alternative answers.

Question 4

(a)   What are the two categories of code-division multiplexing?   [2]

Direct-sequence   **[1]**
Frequency hopping   **[1]**

(b)   Give *one* advantage and *one* disadvantage of CDM.   [2]

advantage - better privacy   **[1]**
disadvantage – higher error rates as the number of users increases   **[1]**

(c)   Describe, with the aid of one or more diagrams, how statistical time division
        multiplexing differs from synchronous time division multiplexing?   [6]

Synchronous TDM allocates time slots to all stations on a round robin
basis regardless of whether they have any data to transmit; and this
leads to the problem of empty time slots   **[2]**
Statistical TDM allocates time slots only to active stations, hence
eliminating the problem of empty time slots   **[2]**
diagrams   **[2]**

(d)   If it is possible to share a composite line rate of 4800bps amongst twelve 1200
        bps terminals using statistical time division, what rate will be needed for a
        synchronous TDM multiplexer?   [2]

1200 x 12 = 14,400bps   **[2]**

(e)   Is it possible to use both Frequency multiplexing and time-division multiplexing
        in order to divide the channel bandwidth. Justify your answer.   [3]

Yes [1], first divide the bandwidth into sub-channels using FDM [1]; and
then multiplex each sub-channel by using TDM to create multiple time
slots. [1]

Do not award half marks.
In all cases give credit for appropriate alternative answers.

Question 5

(a)   When selecting a network operating system, it is almost always necessary to ensure that the operating system supports various standards. Name and describe these standards. [5]

Simple network management protocol for network interoperability **[1]**
Structured Query language for database access **[1]**
Object linking and embedding , an RPC for application interoperability **[1]**
Common Object Request Broken Architecture , an RPC locator for
application interoperability **[1]**
Transmission Control protocol / Internet protocol for heterogeneous
communications **[1]**

(b)   When allocating network resources to users, what are the key aspects the network administrator should consider? [4]

Be stingy when allocating users with access rights **[1]**
Create a place in the structure for users to keep private files **[1]**
Allocate disk space to users in order to promote better storage
housekeeping **[1]**
Restrict access rights to network data files **[1]**

(c)   What are the factors to consider when selecting a network topology? [3]

Physical location of user **[1]**
Type and amount of network usage **[1]**
Current available facilities **[1]**
Level of reliability required **[1]**
Maintenance support required **[1]**

Only three required
Other acceptable reasons should earn credit

(d)   The network server is the heart of the network and thus becomes a major concern. Describe some measures that can be taken to ensure that a sever is well protected. [3]

Access to server room should be restricted to only authorized personnel **[1]**
Environment should be clean and free from dust **[1]**
Should be well ventilated for cooling **[1]**
Other acceptable reasons should earn credit

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