1) Data Communication কাকে বলে? Data Communication এর funda-mental characteristics লিখ।

Ans: Delivery, Accuracy, Timeliness, Jitter

2) Data Communication এর Basic component/element গুলো লিখ।

Ans: Message, Sender, Receiver, Transmission medium, Protocol

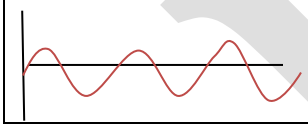
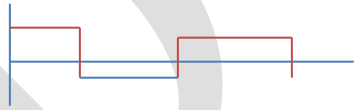
3). Wave properties গুলো লিখ। Ans: Amplitude, Period, Frequency, phase, Wavelength, Speed of propagation

3)Period ও Frequency এর Unit গুলো লিখ।

Unit	Equivalent		Unit	Equivalent
Seconds(s)	1s		Hertz(Hz)	1Hz
Miliseconds(ms)	10^{-3} Hz		Kilohertz(KHz)	10^{3} Hz
Microsecond(us)	10^{-6} Hz		Megahertz(MHz)	10^{6}Hz
Nanoseconds(ns)	10^{-9} Hz		Gigahertz(GHz)	10^{9}Hz
Picoseconds(ps)	10^{-12} Hz		Terahertz(THz)	10^{12}Hz

4) Differentiate between the followings:

(i) Analog Vs. Digital Signals **(ii)** Periodic Vs. Non-Periodic Signals

Analog Signal	Digital Signal
Includes an infinite number of values	Includes an finite number of values
Example: Audio signal	Example: Clocking digital signal
	

Periodic Signal	Non-periodic Signal
A signal which repeats itself	Does not repeat itself
Example: Sine, Cosine, Square etc	Example: Sound signal from radio

5) Application of analog and digital signal

Ans: **Analog Signal:** Thermometer, Audio tape, Photocopiers, VCRs , Old land-line telephone

Digital Signal: Mobile phones, CDs, DVDs, PCs, PDAs

6) একটি Period সিগনালের ৫টি Sine Wave Frequency যথাক্রমে 100,300,500,700 and 900 Hz এ সিগনালের Bandwidth কত?

Ans: Bandwidth=$f_h - f_l$ =900−100=800 Hz

7) Component of PCM Encoder লিখ

Ans: Sampling, Quantization, Binary encoding

8) একটি Network এর Bandwidth 10Mbps, নেটওয়ার্কের মধ্যদিয়ে প্রতিমিনিটে 12000 frames পাঠানো যায়। প্রতি Frame এর গড় 10,000bit ধারন করে। ঐ নেটওয়ার্কের Throughput কত?

Ans: Throughput $= \frac{12000\times10000}{60} = 2000000\text{bit} = 2000\text{Kbps} = 2\text{Mbps}$

9) Bandwidth and Data Rate এর পার্থক্য লিখ।

Bandwidth	Data rate
সর্বোচ্চ ও সর্বনিম্ন frequency মানের পার্থক্য	প্রতি সেকেন্ডে data transfer এর হার
একক হার্টজ(Hz)	একক Bit persecond(bps)
Bandwidth=$f_h - f_l$	Bit Rate=2xB $\log_2 L$, Here L=Number of level

10) Data transmission mode গুলোর প্রকারভেদ আলোচনা কর ।

(i) Simplex : Simplex হচ্ছে একমুখি পদ্ধতি । যেমন- Keyborad, Monitor

(ii) Half-duplex: উভয় পাশ হতে ডাটা আদান প্রদান করতে পারে কিন্তু একই সময়ে করতে পারেনা।

(ii) Full-duplex:একই সময়ে উভয় পাশ হতে ডাটা আদান প্রদান করতে পারে।

11) Network Criteria: Performance, Reliability, Security

12) Transmission Media Characteristics/ Selection এর বিবেচ্য বিষয়গুলো লিখ।

Ans: Cost, Ease of installation, Bandwidth capacity, Node capacity, Attenuation, EMI

13)5-4-3-2-1 Thumb rule বলতে কি বুঝ?

(i). Five section of the networks.
(ii). Four repeaters or hubs.
(iii). Three sections are link segments (for link purposes).
(iv). One large collision domain.

14) Digital Signature কি

Ans: Digital Signature is a technique which is used to validate the authenticity and integrity of the message.

15) Connectivity Device গুলোর বৈশিষ্ট্য/কাজ লিখ।

Ans: Hub, Repeater, Bridge, Switch , Router, Gateway.

16) PAN, LAN, MAN, WAN পার্থক্য লিখ।

Parameters	PAN	LAN	MAN	WAN
পূর্ণরূপ	Personal Area Network	Local Area Network	Metropolitan Area Network	Wide Area Network
Area Covered	Small area	A few meters to a few kilometers	A city	Global
Transmission Speed	Minimum	Minimum	Medium	Maximum
Error Rates	Minimum	Minimum	Medium	Maximum
Networking Cost	Poor	Cheap	Moderately cheap	Expensive
Applications	(i) Device-to-device (ii) Peer-to-peer	Enterprise networks	(i) Fixed, (ii) Last mile access	(i) Mobile phones (ii) Cellular access

17) Twisted pair cable, Co-axial, Fiber optic cable এর সুবিধা ও অসুবিধা লিখ।

Twisted pair cable: There are two types-

(i) Unshielded twisted pair (UTP):

Advantages:

a. It is easy to installation procedure
b. It is basically used in LAN implementations
c. Data transmission speed প্রায় 100 Mbps
d. Data transmit করতে পারে 100 মিটার দূরত্ব পর্যন্ত।

Disadvantages : (a) EMI সমস্যা পুরোপুরি দূর হয় না।
(b) Attenuation বিদ্যমান।

(ii)Shielded twisted pair(STP):

Advantages: (i) Cabling cost কম।
(ii) Colour code দেখে সহজে Cabling করা যায়।

Disadvantages:
(i)Attenuation, EMI, Crosstalk সমস্যা বিদ্যমান।
(ii)Transmission loss বিদ্যমান।

Co-axial cable:

Advantages:
(i) Broadband Systems
(ii) Greater bandwidth
(iii) Lower error rates
(iv) Easy to install and expand
(v) Used for both analog and digital data transmission

Disadvantages:
(i). Bidirectional ugrade required
(ii). Great noise
(iii). Number of node connection is limited.
(iv). Higher installation cost

Fiber optic cable:

Advantages:
(i) Lightweight
(ii) Data transmission speed প্রায় 18600 mile/sec
(iii) Attenuation ,EMI, Crosstalk সমস্যা বিদ্যমান নায়।
(iv) Data transmit a long distance.

Disadvantages:
(i) More expansive
(ii) Difficult to install and maintain
(iii) Typical delay 5μs/km

18) Radio, Inferred, Microwave, Satellite Communication এর বৈশিষ্ট্য লিখ।

Radio communication এর বৈশিষ্ট্যঃ
(i). Electromagnetic wave এর range 3kHz থেকে 1GHz
(ii). Transmission loss বিদ্যমান।
(iii). অধিক ব্যয়বহুল
(iv). EMI সমস্যা বিদ্যমান।

Microwave Communication এর বৈশিষ্ট্যঃ
(i). Electromagnetic wave এর range 1GHz থেকে 300GHz
(ii). EMI সমস্যা বিদ্যমান।
(iii). Installation process জটিল।
(iv). খরচের পরিমান বেশি।

Infrared Communication এর বৈশিষ্ট্যঃ
(i). Electromagnetic wave এর range 300GHz থেকে 400THz
(ii). Wavelength 1mm থেকে 770nm
(iii). Short range communication এর ক্ষেত্রে ব্যবহৃত হয়।

Satellite Communication এর বৈশিষ্ট্য:
(i). Transmission propagation delay সাধারণত 0.5sec থেকে 5sec
(ii). Long distance এর জন্য অধিক ব্যয়বহুল
(iii). Limited bandwidth
(iv). Provides easy communication

19) Topology এর প্রকারভেদ লিখ ।

উত্তরঃ ২প্রকার।

(a) Logical topology

(b) Physical topology:

(i) Bus topology (ii) Star topology (iii)Ring topology
(iv) Tree topology (v)Mesh topology (vi) Hybrid topology

20) Bus, Star, Ring, Tree, Mesh ও Hybrid topology এর সুবিধা অসুবিধা লিখ।

Bus Topology:

Advantages: Installation cost is very low, Easy to set-up, Easy to extend Bus network

Disadvantages:

Security is very low, It is not suitable for networks with heavy traffic, It is difficult to detect and troubleshooting fault at individual station, Difficult to reconfiguration, Signal interference

Star topology:

Advantages: Efficient troubleshooting, Easy to network design and Implementation, familiar technology, High data speeds, Easily expandable.

Disadvantages: A central point of failure : example- Hub, Switch, Requires more wires, যদি হাব অচল হয়ে যায় তখন সমগ্র নেটওয়ার্ক অচল হয়ে যায়।

Ring topology:

Advantages: Installation is very low, Reliable, Equal access to the resources , No need of server

Disadvantages: Ring network is much slower, Difficult to reconfiguration, Difficult to troubleshooting

Tree topology:

Advantages: Easily error detection, Limited failure, Easily manageable, Easily point-to-point wiring, Easy to expand

Disadvantages: High cost, Difficult to reconfiguration, More expensive, Difficult to troubleshooting of the problem.

Mesh topology:

Advantages:

Fast Communication, Easier Reconfiguration, Reliable

Disadvantages: More Cost , Very difficult to maintain, To reduce efficiency because of more connection.

Hybrid topology:

Advantages: Reliable, Flexible, Effective, Scalable

Disadvantages:

Complex design, Costly infrastructure, Costly Hub.

21) Network Protocol কাকে বলে? বৈশিষ্ট্যগুলো লিখ

Ans: Protocol is a set of rules.

Element/Characteristics:

(i) Syntax (ii) Semantics (ii) Timing

22) Protocol এর Rules /ব্যবহারগুলো লিখ।

(i) Data sequencing (v) Connection প্রতিষ্ঠা
(ii) Data Routing (vi) Data Security
(iii) Flow Control (vii) Log Information
(iv) Error Control

23) Protocol এর Function গুলো লিখ।

(i). Encapsulation : Data + Control information
(ii). Fragmentation and Re-assembly
(iii). Connection Control
(iv). Order Delivery (vii). Addressing
(v). Flow Control (viii).Multiplexing
(vi). Error Control (ix).Transmission Services

24) OSI Reference Model এবং TCP/IP model এর Layer এবং Protocol গুলো লিখ।

	OSI layer	TCP/IP layer	Protocol	Data unit
Responsibility of the host	Application	Application	SMTP, FTP, HTTP, DNS, SNMP,TELNET	Data
	Presentation			
	Session			
	Transport	Transport	TCP, UDP, SCTP	Segments
Responsibility of the Network	Network	Network	ICMP,IGMP,RARP,ARP	Packets
	Data link	Data link	CSMA/CD,CSMA/CA	Frames
	Physical	Physical	FHSS,DHSS,OFDM,AM, FM,ASK,PSK,FSK,PCM	Bits

Physical layer এর কাজঃ

(i) Physical characteristics of interfaces and medium
(ii) Line Configuration (v) Data Transmission Mode
(iii) Physical Topology (vi) Data rate
(iv) Synchronization of bits

Data link layer এর কাজঃ

(i) Framing (iv) Physical addressing
(ii) Flow control (v) Error control
(iii) Access control

Network layer এর কাজঃ

(i) Logical addressing (iii) Packetizing
(ii) Routing (iv) Internetworking

Transport layer এর কাজঃ

(i) Service-point addressing
(ii) Segmentation and reassembly
(iii) Connection control (vi) Multiplexing
(iv) Flow control (vii) End-to-end delivery
(v) Error control

Session layer এর কাজঃ

(i) Dialog control (ii) Synchronization

Presentation layer এর কাজঃ

(i) Translation (ii) Encryption (iii) Compression

Application layer এর কাজঃ

(i) Mail services (ii) Directory services
(iii) Networking virtual terminal
(iv) File transfer, access and management

Application Layer Protocol :

(i). DNS (Domain Name System)
(ii). FTP (File Transfer Protocol)
(iii). SMTP (Simple Mail Transfer Protocol)
(iv). SNMP (Simple Network Management Protocol)
(v). HTTP (Hyper Text Transfer Protocol)
(vi). Telnet (Terminal Network)

Network Layer Protocol এর নাম গুলো হলোঃ

(i) ARP (Address Resolution Protocol)
(ii) RARP (Reverse Resolution Protocol)
(iii) ICMP (Internet Control Message Protocol)
(iv) IGMP (Internet Group Message Protocol)
(v) IP (Internetworking Protocol)

Transport Layer Protocol এর নাম গুলো হলোঃ

(i) UDP (User Datagram Protocol)
(ii) TCP (Transmission Control Protocol)
(iii) SCTP (Stream Control Transmission Protocol)

25) কোন Layer এ কোন Connectivity Device কাজ করে?

Layer	Connectivity Device
Application	Gateway
Transport	Gateway
Network	Router
Data Link	Switch, Bridge
Physical	Hub, Repeater

26) Differences between TCP and UDP

TCP	UDP
TCP পূর্ণরুপ Transmission control protocol	UDP User datagram protocol
Connection oriented protocol	Connection less protocol
The packet produced by the UDP protocol	Un-reliable
Suitable for non-real time applition(FTP,SMTP,POP,HTTP)	Suitable for non-real time application(voice,video)
Speed is slow	Speed is high
Heade size is 20bytes	Header size is 8 bytes

27) Addressing: There are four types such as-

(i). Physical address/MAC address
(ii). Logical address [IPV_4(32bit),IPV_6(128bit)]
(iii). Port address
(iv). Specific address(URL,email)

28)Classless and Classful addressing বা Routing পার্থক্য লিখ।

Classful addressing	Classless addressing
Address have three parts such as Network, Subnet and Host	Address have two parts such as Subnet or Prefix and Host
Do not support VLSM	Support VLSM
Does not includes subnet mask in routing updates	Includes subnet mask in routing updates
Example: RIPv1	Example: RIPv1,BGP, OSPF and EIGRP

10) Base 5, 10 Base 2, 10 Base T, 10 Base F পার্থক্য লিখ।

Name	Cable	Maximum segment	Nodes/Segment	Topology
10Base5	Thick coaxial	500meters	100	Bus
10Base2	Thin coaxial	185meters	30	Bus
10Base-T	Twisted pair	100metrs	1024	Star
10Base-F	Fiber optics	2000meters	1024	Star

29) FDDI এর সুবিধা অসুবিধা লিখ এবং Element গুলো লিখ।

সুবিধা	অসুবিধা	উপাদান
(i) Concentrator device ব্যবহৃত হয়। (ii) High speed and more flexibility in this network (iii) Work on 13km area	Fiber optic cable ব্যবহারের কারনে অত্যন্ত ব্যয়বহুল।	(i) Concentrator, (ii) Converter, (iii) FDDI NIC card (iv) Converter

30) পার্থক্য লিখ।

Parameters	Router	Switch
Operate	Network layer	Data link layer
Ports	2/4/8	It is multiport:24/48
Used in	LAN, MAN	LAN
Data transmission form	Packet	Both packet and frame
Table	Store IP address in routing table	Store MAC address in a look up table
Speed	Wireless: 1-10Mbps , Wired: 100Mbps	Wireless:10-100Mbps , Wired: 1Gbps

Parameters	Router	Bridge
Operate	Network layer	Data link
Ports	More ports	Only two ports
Reads	IP address of a device	MAC address of a device
Used In	LAN, WAN	LAN
In data sending	Routing table	Does not routing

Peer-to-Peer Network	Client-Server Network
সংযুক্ত সকল computer এর Resource sharing এ সমান অধিকার রয়েছে।	Central computer কে Server বলে। Server এর সাথে সংযুক্ত computer কে Client বলে।
খরচ তুলনামূলক কম।	খরচ বেশি।
Easy to design and maintenance	Difficult to design and maintenance

Peer-to-Peer Network	Client-Server Network
সংযুক্ত সকল computer এর Resource sharing এ সমান অধিকার রয়েছে।	Central computer কে Server বলে। Server এর সাথে সংযুক্ত computer কে Client বলে।
খরচ তুলনামূলক কম।	খরচ বেশি।
Easy to design and maintenance	Difficult to design and maintenance

31) Transport layer protocol এর সম্পর্কে লিখ।

Ans: TCP Segment Format

Source port address 16 bits								Destination port address 16 bits
Sequence number 32 bits								
Acknowledgement number 32 bits								
HLEN 4 bits	Reserved 6 bits	URG	ACK	PSH	RST	SYN	FIN	Window size 16 bits
Checksum 16 bits								Urgent pointer 16 bits
Options & padding								

User Data Format:

source port address 16-bits	Destination port address 16bits
Total lengh 16 bits	Checksum 16-bits
Data	

Self Study:

32) টীকা লিখঃ

Crosstalk, EMI, Baseband,Broadband, Line Coding, MAC Address, PDU, Attenuation, spectrum, SNR, Guard band Interleaving, synchronizing , Omnidiretional and Unidirectional Transmission

33) Write short notes on the following:-
(i) Single bit error (ii) Burst error and burst length
(ii) Redundancy

34) IEEE এর বৈশিষ্ট্যগুলো লিখ।

35) Default Subnet mask, DNS, Subnet Mask , Su-perneting কি?

36) CSMA/CA, CSMA/CD সম্পর্কে লিখ।

37) How to calculate subnet mask from IP address ?

Reference picture: 31 No এর TCP

আমাদের Facebook Page: Fury Tent

রচনায় ও সম্পাদনায়ঃ

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