**COMPUTER NETWORKS**

***QUES:- What services does the Internet Layer provide?***

1. Quality of service 2. Routing 3.Addressing 4. Connection-oriented delivery 5. Framing bits

(A) 1, 2, 3 (yes) (B) 2, 3, 4 (C) 1, 3, 4, 5 (D) 2, 3, 4, 5

**ATM:-**

ATM transfers information in fixed-size units called cells. Each cell consists of 53 octets, or bytes. The first 5 bytes contain cell-header information, and the remaining 48 contain the payload (user information)

***QUES:- The ATM cells are ................ bytes long.***

(A) 48 (B) 53(yes) (C) 64 (D) 69

***QUES:-How many Character per sec(7bits + 1parity) can be transmitted over a 2400 bps line if the transfer is synchronous (1 "Start" and 1 "stop" bit)?***

A. 300(yes) B. 240 C. 250 D. 275

**Solution:-** Start and stop bits are not needed in synchronous transfer of data. So, it is 2400/8=300.

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***How many characters per second (7 bits + 1 parity) can be transmitted over a 3200 bps line if the transfer is asynchronous? (Assuming 1 start bit and 1 stop bit)***

(A) 300 (B) 320(yes) (C) 360 (D) 400

Explanation:- One character needs (7+1+1+1)=10 bits. A line can transfer 3200 bits/sec hence it can accommodate 320 characters/s.

Asynchronous : 320

***NOTE***

In synchronous transmission, we need to send ONLY data and parity in each character

Size of a character =7+1=8

Number of characters sent in one Second =3200/8=400

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***How many 8-bit characters can be transmitted per second over a 9600 baud serial communication link using asynchronous mode of transmission with one start bit, eight data bits, two stop bits and one parity bit?***

a)600 b)800(yes) c)876 d)1200

Explanation:-

"9600 baud" means that the serial port is capable of transferring a maximum of 9600 bits per second."

So, transmission rate here = 9600 bps

An eight bit data (which is a char) requires 1 start bit, 2 stop bits and 1 parity bit = 12 bits.

So, number of characters transmitted per second = 9600 / 12 = 800

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***What is the propagation time if the distance between the two points is 48,000 ? Assume the propagation speed to be 2.4×108 metre/second in cable.***

A)0.5ms B)20 ms C) 50 ms D) 200 ms

Propagation time = distance between two point / propagation speed.

Distance between two point = 48000 km = 48 x 106.

Propagation speed = 2.4 × 108.

propagation time = 48 x 106 / 2.4 × 108

= 0.2 sec = 200 ms Hence,Option(D) 200 ms.

*Note: speed = distance / time (Remember this formulae)*

***QUES:- If the period of a signal is 1000 ms, then what is its frequency in kilohertz***

**ANS:-** The relationship between frequency and period is given by the formula f = 1/T. First we change 1000 ms to seconds and then we calculate the frequency.

1000 ms = 1000 X 10^ -3 s = 1 s

f=1/t = 1/1 hz = 1 hz

= 1 X 10^ -3 Khz = 10^ -3KHz

***The period of a signal is 10 ms. What is its frequency in Hertz ?***

(A) 10 (B) 100(yes) (C) 1000 (D) 10000

***QUES:-Electronic Data Interchange Software consists of the following four layers:***

(A) Business application, Internal format conversion, Network translator, EDI envelope

(B) Business application, Internal format conversion, EDI translator, EDI envelope(ANS)

(C) Application layer, Transport layer, EDI translator, EDI envelope

(D) Application layer, Transport layer, IP layer, EDI envelope

***QUES:- An analog signal carries 4 bits in each signal unit. If 1000 signal units are sent per second, then baud rate and bit rate of the signal are …………… and …………..***

(A) 4000 bauds \ sec & 1000 bps (B) 2000 bauds \ sec & 1000 bps

(C) 1000 bauds \ sec & 500 bps (D) 1000 bauds \ sec & 4000 bps(yes)

***QUES:- Using the RSA public key crypto system, if p=13, q=31 and d=7, then the value of e is***

(A) 101 (B) 105 (C) 103(yes) (D) 107

**Explanation:**

Basic RSA Algorithm:

Choose two primes, p & q.

Compute n=p\*q and z=(p-1)\*(q-1).

Choose a number relatively prime to z and call it d.

Find e such that e\*d=1modz.

Given p=13, q=31 & d=7, e=?

n = p\*q = 403

z = (p-1) (q-1) = 360

e\*d=1 mod z

7e=1mod360, then 7e must be 361, 721, 1081, 1441, etc. Dividing each of these in turn by 7 to see which is divisible by 7, we find that 721/7 = 103, hence e = 103.

**Ques:- Using ‘RSA’ public key cryptosystem, if P = 3, q = 11 and d = 7, find the value of e and encrypt the number ‘19’.**

(1) 20, 19 (2) 33, 11 (3) 3, 28 (4) 77, 28

**Answer:-**

1) n = p \* q = 3 \* 11 = 33

2) Q = (p - 1) \* (q - 1) = 20

3) gcd(e, q) = 1

4) de mod Q = 1

5) 7e mod 20 = 1 // 7e must be 21, 41 and so on

6) if e = 3 then 7e mod 20 = 1 so e = 3;

7) public key = (n, e) = (33, 3)

8) private key = (n, d) = (33, 7)

9) cipher text = M pow e mod n = 19 pow 3 mod 33 = 6859 mod 33 = 28

***QUES:- Using p=3, q=13, d=7 and e=3 in the RSA algorithm, what is the value of cipher text for a plain text 5?***

1. 13 B) 21 C) 26 D) 33(yes)

**Explanation :**

p=3, q=13, d=7, e=3, M=5, C=?

n = p\*q = 3\*13 = 39

C = M^e mod n = 5^3 mod 39 = 8

***QUES:- What is the maximum operating rate of a wireless LAN using infrared communication?***

(A) 1 mbps(yes) (B) 2 mbps (C) 5 mbps (D) 11mbps

***QUES:- The cost of the network is usually determined by***

(A) time complexity (B) switching complexity(YES)

(C) circuit complexity (D) none of these

***QUES:- CDMA Cell uses …………… carriers of 1.25 MHz.***

(A) 9(YES) (B) 18 (C) 22 (D) 64

***QUES:- With reference to hierarchical routing, the optimum number of levels for an m router subnet is:***

(A) m2 (B) m (C) ln m(yes) (D) √m

***QUES:- An example of an adaptive routing algorithm is:***

(A) distance vector routing (yes) (B) flooding

(C) selective flooding (D) shortest path routing

***QUES:- In a binary Hamming code the number of check digits is r then number of message digits is equal to***:

(A) 2r-1 (B) 2r-r-1(yes) (C) 2r-r+1 (D) 2r+r-1

***QUES:- The Maximum payload of a TCP segment is***

(A) 65,535 (B) 65,515 (C) 65,495(yes) (D) 65,475

Explanation:- The minimum payload of a TCP segment is

= Max size - Header Size = 65,515 - 20 = 65,495 Bytes

***QUES:- A message “COMPUTERNETWORK” encrypted(ignore quotes)using columnar transposition cipher with a key “LAYER”. The encrypted message is:***

(A) CTTOEWMROPNRUEK (B) MROUEKCTTPNROEW

(C) OEWPNRCTTUEKMRO(yes) (D) UEKPNRMROOEWCTT

***QUES:- In a digital transmission, the receiver clock is 0.1 percent faster than the sender clock. How many extra bits per second does the receiver receive if the data rate is 1 kbps? (ugc – jun-2014)***

***a)10 bps b)100 bps c)1000 bps d)10000 bps***

**Solution:-** Given,receiver clock is 0.1% faster than sender clock.

At 1 Mbps bits send by sender = 1000000

receiver clock is 0.1% faster than sender clock so Extra bits received by receiver

=  1000000 \* 0.1 / 100   = 1000 bits

Total bits received by received= 1001000 bits

Extra bit per second received by receiver= 1000 bps

***QUES:- If link transmits 4000 frames per second, and each slot has 8 bits,the transmission rate of circuit this TDM is (ugc – july -2016)***

A. 32kbps(yes) B. 500bps C. 500kbps D. None of the mentioned

**Explanation:** Transmission rate = frame rate \* number of bits in a slot.

***QUES:- An analog signal has a bit rate of 8000 bps and a baud rate of 1000. Then analog signal has \_\_\_\_\_ signal elements and carry \_\_\_\_\_ data elements in each signal. (ugc 2016 – Aug)***

***(A) 256, 8 bits (B) 128, 4 bits (C) 256, 4 bits (D) 128, 8 bits***

Explanation :-bit rate = 8000 bps; baud rate = 1000; (Given)

Each signal carries = 8000 / 1000 = 8; No. of signal elements = 2^8 = 256; So Ans is 256, 8

A signal element is the shortest unit of a digital signal. Data elements are what we need to send; signal elements are what we can send. Data elements are being carried; signal elements are the carriers.

***QUES:- Encrypt the plain text Message “EXTRANET” using Transposition cipher technique with the following key : Using ‘Z’ as bogus character.***

(1) TAXERTZENZ (2) EXTRANETZZ (3) EZXZTRZANZET (4) EXTZRANZETZ

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| E | X | T | R | A | N | E | T | Z | Z |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3 | 5 | 2 | 1 | 4 | 3 | 5 | 2 | 1 | 4 |
| T | A | X | E | R | T | Z | E | N | Z |

***In a packet switching network, if the message size is 48 bytes and each packet contains a header of 3 bytes. If 24 packets are required to transmit the message, the packet size is*** \_\_\_\_\_\_\_\_.

(1) 2 bytes (2) 1 byte (3) 4 bytes (4) 5 bytes(yes)

**Explanation:**- 24 packet requires to carry 48 byte of data, so each packet carries 48/24=2Bytre of Data. now each packet has got 3 byte of Header. So packet size= 2+3=5Byte.

***QUES:- A node X on a 10 Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 2 Mbps. Token bucket is initially filled with 16 megabits. The maximum duration taken by X to transmit at full rate of 10 Mbps is \_\_\_\_\_\_\_\_\_ secs.***

(1) 1 (2) 2(yes) (3) 3 (4) 4

**Explanation:-**Maximum burst time = Capacity /(Output rate-Arrival rate ) = 16/(10-2) = 2 seconds

***A computer on a 10Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 2Mbps. It is initially filled to capacity with 16Megabits. What is the maximum duration for which the computer can transmit at the full 10Mbps?***

(A) 1.6 seconds (B) 2 seconds (C) 5 seconds (D) 8 seconds

Answer (B)

Explanation :-

New tokens are added at the rate of r bytes/sec which is 2Mbps in the given question.

Capacity of the token bucket (b) = 16 Mbits

Maximum possible transmission rate (M) = 10Mbps

So the maximum burst time = b/(M-r) = 16/(10-2) = 2 seconds

In the above formula, r is subtracted from M to calculate the maximum burst time. The reason for this subtraction is, new tokens are added at the rate of r while transmission happens at maximum transmission rate M.

***Quest- A computer on a 10-Mbps is regulated by a token bucket. The Token Bucket is filled at rate of 2 Mbps. It is initially filled to capacity with 20 Megabits. How long can the computer transmit at the full 10-Mbps (in seconds)?***

**Explanation-** we get burst length S = C / (M − R) = 20 / 10 − 2 = 2.5 seconds

***QUES:- Consider a source with symbols A, B, C, D with probabilities 1/2, 1/4, 1/8, 1/8 respectively. What is the average number of bits per symbol for the Huffman code generated from above information ?***

(1) 2 bits per symbol (2) 1.75 bits per symbol (3) 1.50 bits per symbol (4) 1.25 bits per symbol

Explanation:- The average length (bits/symbol) is,The average number of bits per symbol for this code is

***Which of the following algorithms is not a broadcast routing algorithm ?***

(a)Flooding (b)Multidestination routing

(c)Reverse path forwarding (d)All of the above(yes)

**Explanation:-**

Broadcast packets are not routed and forwarded by the routers on any network.

Broadcast routing can be done in two ways :

A router creates a data packet and then sends it to each host one by one. In this case, the router creates multiple copies of single data packet with different destination addresses. All packets are sent as unicast but because they are sent to all, it simulates as if router is broadcasting.

Secondly, when router receives a packet that is to be broadcasted, it simply floods those packets out of all interfaces. All routers are configured in the same way. This method is easy on router's CPU but may cause the problem of duplicate packets received from peer routers.

Reverse path forwarding is a technique, in which router knows in advance about its predecessor from where it should receive broadcast. This technique is used to detect and discard duplicates

Flooding is simplest method packet forwarding. When a packet is received, the routers send it to all the interfaces except the one on which it was received.

***Which of the following switching techniques is most suitable for interactive traffic ?***

(A) Circuit switching (B) Message switching

(C) Packet switching(yes) (D) All of the above

***A smart modem can dial, hangup and answer incoming calls automatically. Can you tell who provides the appropriate instructions to the modem for this purpose ?***

(A) Communication software(yes) (B) Error detection protocols

(C) Link access procedure (LAP) (D) Telecommunications

***If carrier modulated by a digital bit stream, has one of the possible phase of 0, 90, 180 and 270 degrees, then modulation called ( ugc june – 2011 )***

(A) BPSK (B) QPSK(yes) (C) QAM (D) MSK

**Explanation:-** This is the phase shift keying technique, in which the sine wave carrier takes four phase reversals such as 0°, 90°, 180°, and 270°.

***A comparison of frequency division and time division multiplexing system shows that (ugc – june-2011)***

(A) FDM requires a lower bandwidth, but TDM has greater noise immunity.(yes)

(B) FDM has greater noise immunity and requires lower bandwidth than TDM.

(C) FDM requires channel synchronization, while TDM has greater noise immunity.(yes)

(D) FDM requires more multiplex while TDM requires band pass filter.

***In \_\_\_\_\_\_\_\_ substitution, a character in the plaintext is always changed to the same character in the ciphertext, regardless of its position in the text.***

(A) polyalphabetic (B) monoalphabetic(yes) (C) transpositional (D) multialphabetic

***Which of the following substitution technique have the relationship between a character in the plaintext and a character in the ciphertext as one-to-many?***

(A) Monoalphabetic (B) Polyalphabetic(yes) (C) Transpositional (D) None of the above

***From the given data below : a b b a a b b a a b which one of the following is not a word in the dictionary created by LZ-coding (the initial words are a, b) ? (ugc – 2016 –Dec)***

(1) a b (2) b b (3) b a (4) b a a b(yes)

**Explanation:**- input is : a b b a a b b a a b

so the dictionary contains: a | b | ba | ab| baa | b (is already there)

so option B and D both r not there in dictionary

***How many DS1 signals are transported on a DS3 signal ?***

(A) 24 (B) 672 (C) 14 (D) 28(yes)

**Explanation:-**

A Digital Signal 3 (DS3) is a digital signal level 3 T-carrier. It may also be refered to as T3 line.

1. The data rate for this type if signal is 44.736 Mbit/s (45Mb)

1. The data rate for DS1 signal is 1.5 Mbit/s (1.5Mb)

2. This level of carrier can transport 28 DS1 level signals within its payload.

3. This level of carrier can transport 672 DS0 level channels within its payload.

***The LAPB frame structure and the frame structure of SDLC are :***

(A) Opposite (B) Identical(yes)

(C) Reversed (D) Non-identical

***If the baud rate is 400 for a QPSK signal, the bit rate is ———————bit/s.***

1) 100 2) 400 3) 800(yes) 4) 1600

**Explanation:-** QPSK allows the signal to carry twice as much information as ordinary PSK using the same bandwidth.

***An organization has a class B network and wishes to form subnets for 64 departments. The subnet mask would be***

1) 255.255.0.0 2) 255.255.64.0 3) 255.255.128.0 4) 255.255.252.0(yes)

**Explanation**:- To form subnet for 64 departments we need 6 continuous bit and the value of 11111100 = 252. Organization has class B network so subnet mask would be 255.255.252.0.

***The subnet mask 255.255.255.192***

(A) Extends the network portion to 16 bits

(B) Extends the network portion to 26 bits(yes)

(C) Extends the network portion to 36 bits

(D) Has no effect on the network portion of an IP address

***With an IP address of 201.142.23.12 what is your default subnet mask?***

A)0.0.0.0 B)255.0.0.0 C)255.255.0.0 D)255.255.255.0(yes)

***QUES:- What is the network address if one of the addresses is 167.199.170.82/27?***

The prefix length is 27, which means that we must keep the first 27 bits as is and change the remaining bits (5) to 0s. The 5 bits affect only the last byte. The last byte is 01010010. Changing the last 5 bits to 0s, we get 01000000 or 64. The network address is 167.199.170.64/27.

***In a classful addressing, first four bits in Class A IP address is***

(A) 1010 (B) 1100 (C) 1011 (D) 1110

**Explanation:-** No option is correct. Because In class A, the first bit of the first octet is always set to 0 (zero).

***Which class of IP address provides a maximum of only 254 host addresses per network ID?***

a) Class A b) Class B c) Class C(ANS) d) Class D

***Which of the following is private IP address?***

a) 192.168.24.43 (ANS) b) 168.172.19.39 c) 172.15.14.36 d) 12.0.0.1

***A network with bandwidth of 10 Mbps can pass only an average of 15,000 frames per minute with each frame carrying an average of 8,000 bits. What is the throughput of this network ?***

A) 2 Mbps B) 60 Mbps C) 120 Mbps D) 1010 Mbps

**Explanation:-**

In data transmission, throughput is the amount of data moved successfully from one place to another in a given period of time,

and typically measured in bits per second (bps), or in megabits per second (Mbps) or gigabits per second (Gbps).

Here, Throughput = 15000 x 8000/60 = 2 Mbps

***In Ethernet, when Manchester encoding is used, the bit rate is***

1) Half the baud rate(yes) 2) Twice the baud rate

3) Same as the baud rate 4) Thrice the baud rate

**Explanation:-** Bit rate is half the baud rate in Manchester encoding as bits are transferred only during a positive transition of the clock.



***For a channel of 3 KHz bandwidth and signal to noise ratio of 30 dB, the maximum data rate is:***

(A) 3000 bps (B) 6000 bps (C) 15000 bps (D) 30000 bps(yes)

Expalanation:-

C = 3000 \* log2(1001)

which is a little less than 30 kbps.

so for example a signal-to-noise ratio of 1000 is commonly expressed as

10 \* log10(1000) = 30 dB.

(http://www.inf.fu-berlin.de/lehre/WS01/19548-U/shannon.html)



**Which of the following devices modulates digital signals into analog signals that can be sent over traditional telephone lines?**

(1) Router (2) Gateway (3) Switch (4) Modem (5) NIC

**Ans.** (4) Modem is device that modulates Digital Signals to Analog Signals that can be sent to telephone line.

**Q.2. Which of the following devices takes data sent from one network device and forwards it to all devices on the network regardless of the intended recipient?**

(1) DNS Server (2) Switch (3) Hub (4) Gateway (5) All

Ans. (3) Hub is a basic Network Device that sent data from one network device and sent to all devices because Hub is a broadcasting device.

**Q.3. Which of the following devices takes data sent from one network device and forwards it to the destination node based on MAC address?**

(1) Hub (2) Switch (3) Gateway (4) Modem (5) All

Ans. (2) Switch is a unicasting device and sent data to particular another device according to MAC address.

***Which of the following devices is used to connect different network segments and manage the traffic between them?***

(1) Switch (2) Hub (3) Gateway (4) Repeater (5) Bridge

Ans. (5) Bridge is used to connect different network segments and manage the traffic between them.

***Which of the following devices direct network traffic based not by MAC addresses but by software-configured network addresses?***

(1) Router (2) Hub (3) Bridge (4) NIC (5) None of these

Ans. (1) Router is a software based device that can be configuring Network Address According to requirements.

**Q.6. Which of the following network devices/systems translates data from one format to another?**

(1) Hub (2) DHCP Server (3) Gateway (4) NIC (5) Switch

Ans. (3) Gateway network devices/systems translate data from one format to another.

**Q.7. Switch is a device of \_\_\_\_\_\_\_\_\_ Layer of OSI Model.**

(1) Network Layer (2) Transport Layer (3) Application Layer (4) Session Layer (5) Data Link Layer

Ans. (5) Switches operate on the second layer of OSI Model that is Data Link Layer.

**Q.8. Hub is a \_\_\_\_\_\_\_\_\_ Device and Switch is a \_\_\_\_\_\_\_\_ Device.**

(1) Unicast, Multicast (2) Multicast, Unicast (3) Broadcast, Unicast

(4) Unicast, Unicast (5) Multicast, Multicast

Ans. (3) Hub is a Broadcasting Device and Switch is a Unicasting Device.

***Star Topology is based on a Central Device that can be \_\_\_\_\_\_\_\_\_\_.?***

(1) HUB 2) Switch (3) Router (4) Both 1 and 2 (5) Gateway

Ans. (4) Hub and Switch are used in Star Type Networks.

***Which of the following protocols is used by email server to maintain a central repository***

***that can be accessed from any machine ?***

(1) POP3 (2) IMAP(YES) (3) SMTP (4) DMSP

***An attacker sits between customer and Banker, and captures the information from the***

***customer and retransmits to the banker by altering the information. This attack is called as***

(1) Masquerade Attack (2) Replay Attack(yes)

(3) Passive Attack (4) Denial of Service Attack

***An attacker sits between the sender and receiver and captures the information and***

***retransmits to the receiver after some time without altering the information. This attack is***

***called as \_\_\_\_\_.***

(1) Denial of service attack(YES) (2) Masquarade attack (3) Simple attack

(4) Complex attack

***Four channels are multiplexed using TDM. If each channel sends 100 bytes/second and we multiplex 1 byte per channel, then the bit rate for the link is***

A) 400 bps B) 800 bps C) 1600 bps D)3200 bps

**Explanation 1 :-**

Each frame carries 1 byte from each channel; we have 4 channels

The size of each frame, therefore, is 1x4= 4 bytes, or 32 bits.

Each channel is sending 100 bytes/s and a frame carries 1 byte from each channel, the frame rate must be 100 frames per second. The bit rate is 100 &times; 32 = 3200 bps.

**Explanation 2 :-**

one channel sends 100 bytes/sec

four channel send 400 bytes multiplex one complete byte per channel

bit rate =400x8=3200bps

**Firewall is a device that filters access to the protected network from the outside network. Firewalls can filter the packets on the basis of**

(A) Source IP Address (B) Destination IP Address (C) TCP Source Port

(D) UDP Source Port (E) TCP Destination Port

Choose the correct answer from the options given below :

(1) (A), (B) and (C) only (2) (B) and (E) only

(3) (C) and (D) only (4) (A), (B), (C), (D) and (E) only (ans)

**Find the lexicographic ordering of the bit strings given below based on the ordering 0 < 1. (jun-2020)**

(A) 001 (B) 010 (C) 011 (D) 0001 (E) 0101

Choose the correct answer from the options given below :

(1) 001 < 010 < 011 < 0001 < 0101 (2) 0001 < 001 < 010 < 0101 < 011

(3) 0001 < 0101 < 001 < 010 < 011 (4) 001 < 010 < 0001 < 0101 < 011

Explanation:-

Lexicographic ordering (or dictionary ordering) since 0<1 0 appears before 1

Right ans option B) 0001<001<010<0101<011

for better understanding replace 0 by A and 1 by B now arrange alphabetically

AAAB<AAB<ABA<ABAB<ABB



**Find the lexicographic ordering of the bit strings 0, 01, 11, 001, 010, 011, 0001, and 0101 based on the ordering 0 < 1.**

Ans:- 0 < 0001 < 001 < 01 < 010 < 0101 < 011 < 11

***Consider the following activities related to email.***

***m1: Send an email from mailbox server to a mail client***

***m2: Download an email from mailbox server to a mail client***

***m3: Checking email in a web browser***

***Which application level protocol used in each activity?***

(A) m1:HTTP m2:SMTP m3:POP

(B) m1:SMTP m2:FTP m3:HTTP

(C) m1:SMTP m2:POP m3:HTTP (ans)

(D) m1:POP m2:SMTP m3:IMAP

***Explanation:***

"SMTP is a push protocol; it pushes the message from the client to server"

"POP and IMAP supports pull protocol they can pull the message from the server"

"Web-Based mail: Mail transfer from Alice's browser to her mail server is done through HTTP. The message from the receiving server (the Web server) to Bob's browser is done through HTTP."

-Forouzan (Data Communications and Networking)