**COMPUTER NETWORKS**

***QUES:- What services does the Internet Layer provide? (NET-2010-PII)***

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

**Explanation:-**

Internet protocol provide Routing, Addressing, qulaity of service as tcp is responsible for connection oriented delievery and ip is responsible to get the packet address .

Quality of service : Transport Layer

Routing : Network Layer

Addressing : Network Layer

Connection oriented delivery : Network Layer, Transport Layer

Framing bit : DataLink Layer

**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)? (ISRO-2015)***

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) (NET-2014-DEC-PIII)***

(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 (UGC – June 2012)***

**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

***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 ? (NET – 2015 – Dec)***

A) 2 Mbps(yes) 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).

i.e. 15,000 frames per minute. Each Frame is carrying 8,000 bits

So, 15,000 \* 8,000 / 60 seconds.

= 2 \* 1000000 bits / seconds.

= 2 Mbps.

**A network with bandwidth of 10 Mbps can pass only an average of 12,000 frames per minute with each frame carrying an average of 10,000 bits. What is the throughput of this network? (NET - Dec - 2019)**

(A) 1,000,000 bps (B) 2,000,000 bps(yes)

(C) 12,000,000 bps (D) 1,200,00,000 bps

***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.

**Using RSA algorithm, what is the value of cipher text C, if the plain text M = 5 and p = 3, q = 11 & d = 7 ? (Dec - 2022)**

(A) 33 (B) 5 (C) 25 (D) 26

**Explanation:-**

Given p=3,q=11. n=(p X q) = (3 X 11)=33  
   m=(p-1)X(q-1) = (2 X 10)=20  
Find a small odd integer e, that is relatively prime to m.  
If e=3, then GCD(3,20)=1. e should be small and prime and so we let e=3.  
d is given, d=7.  
Public key = (e,n). (Values of e and n are known).  
To encrypt a message, we apply the public key to the function   
**E(s) = se(mod n)**

where **s is the given message** and e and n represent the public key integer pair. In the above question, the plain text M = 5. Plain text needs to be encrypted using the above formula.  
   =53(mod 33)  
   = 125 (mod 33)  
   = 26  
As a result, the encrypted message E(s) = 26. This is what gets transmitted.

Ref https://gateoverflow.in/57365/Ugcnet-dec2012-iii-8

**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: (NET-2008-JUL)***

(A) m2 (B) m (C) ln m(yes) (D) √m

***Consider a subnet with 720 routers. If a three-level hierarchy is choosen with eight clusters, each containing 9 regions of 10 routers, then total number of entries in the routing table is \_\_\_\_\_\_\_\_\_\_. (NET - 2015 - DEC, 2019 - DEC)***

(A) 25 (yes) (B) 27 (C) 53 (D) 72

**Explanation:** Eight clusters, each containing 9 regions of 10 routers is a 3 level hierarchy.

Each router needs 10 entries for local router, 8 entries for routing the other regions and for distant cluster it need 7 enrties.

i.e. total 10 + 8 + 7 = 25 entries. So, option (A) is correct.

**Another Explanation:-**

Cluster \* Region \* Routers = 720

We use the given formula to find minimum size of Routing table:

( Cluster-1 ) + ( Region-1 ) + Routers

Therefore, here also Cluster = 8, Region = 9 & Routers = 10

( 8-1 ) + ( 9-1 ) + 10 = 7 + 8 + 10 = 25.

Ref:- https://gateoverflow.in/48618/Ugcnet-dec2015-iii-12

***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.

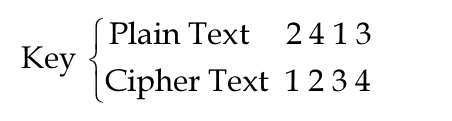
***QUES:- Encrypt the plain text Message “EXTRANET” using Transposition cipher technique with the following key : Using ‘Z’ as bogus character.***

(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 |

**Encrypt the Message “HELLO MY DEARZ” using Transposition Cipher with (2018 - July)**



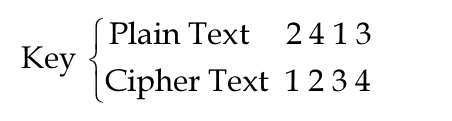
(A) HLLEO YM AEDRZ

(B) EHOLL ZYM RAED

(C) ELHL MDOY AZER

(D) ELHL DOMY ZAER

**Explanation:** In question encryption of given message using Transposition Cipher with



Given message is “HELLO MY DEARZ” Now arrange thenm in group of 4

I.e. HELL OMYD EARZ

i.e. replace second character in abobe format to the first place and fourth character to the second place, first character to the third place and third character to the fourth place.

Encrypted message will be ELHL MDOY AZER.

So, option (C) is correct.

***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

**A text is made up of the characters α, β, γ, δ and σ with the probability 0.12, 0.40, 0.15, 0.08 and 0.25 respectively. The optimal coding technique will have the average length of (NET - 2014 - june - PII)**

(A) 1.7 (B) 2.15 (yes) (C) 3.4 (D) 3.8

***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

**Explanation:-** Class A private address range is 10.0.0.0 through 10.255.255.255. Class B private address range is 172.16.0.0 through 172.31.255.255, and Class C private address range is 192.168.0.0 through 192.168.255.255.

***The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and the maximum number of hosts in each subnet? (2017-Nov)***

1) 62 subnets and 262142 hosts.

2) 64 subnets and 262142 hosts.

3) 62 subnets and 1022 hosts. (yes)

4) 64 subnets and 1024 hosts.

**Explanation:-**

Ref https://testbook.com/question-answer/the-address-of-a-class-b-host-is-to-be-split-into--604a0a1e7f2eb1edd8d4a6b0

**The subnet mask 255.255.255.192**

(A) extends the network portion to 16 bits

(B) extends the network portion to 26 bits

(C) extends the network portion to 36 bits

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

Answer: (B)

Explanation:

Default sub-net mask for Class C is 255.255.255.192

(192)10 = (11000000)2

Since, 192 is written as 11000000, it has 2 sub-nets and remaining all hosts.

So, for first three octets, 24 bits are fixed and for last octet 2 bits are fixed, i.e. 24 + 2 = 26 bits

Option (B) is correct.

**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)

**Explanation:-**

\*) Suppose you are given IP address with no subnet mask

\*) Then use the subnet mask assigned to the class

\*) Here IP address starts with 201 then class C.

\*) Class C has the range of 192 to 223

**Examples to find default subnet mask**

1) 129.13.220.15 class B and subnet mask is 255.255.0.0

2) 118.52.42.6 class A and subnet mask is 255.0.0.0

2 222.111.222.111 class C and subnet mask is 255.255.255.0

**You need 500 subnets, each with about 100 usable host address per subnet. What network mask will you assign using a class B network address ? (net-2019)**

(1) 255·255·255·252 (2) 255·255·255·128(yes)

(3) 255·255·255·0 (4) 255·255·254·0

**Exercise 1**

If IP Address: 190.138.23.45 And Subnet Mask: 255.255.0.0

Then Network ID: 190.138.0.0 And Host ID: 23.45

**Exercise 2**

If IP Address: 201.100.26.171 And Subnet Mask: 255.255.255.192

Subnet mask 11111111.11111111.11111111.11000000

If First 26 bits as network ID, therefore Network ID: 201.100.26.128 Host ID: 43

***In Ethernet, when Manchester encoding is used, the bit rate is(net-2021, gate-2007)***

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)

**Which of the following protocols is used by email server to maintain a central repository that can be accessed from any machine?(NET-2016-P2)**

(A) POP3 (B) IMAP(yes) (C) SMTP (D) DMSP

Explanation:-

The POP3 protocol is the third version of the post office protocol. POP is a protocol that listens on port 110 and is used to access a client machine's mail service. POP3 has two modes of operation: delete mode and keep mode.

IMAP stands for Internet Messaged Access Protocol, and it is used by email servers to keep a central repository accessible from any workstation.

The SMTP protocol stands for Simple Mail Transfer Protocol.

The DMSP protocol stands for distributed mail service protocol.

***Suppose a cloud contains software stack such as Operating system, Application software, etc. This model is referred as \_\_\_\_\_\_\_\_\_ model. (UGC – Dec – 2018)***

(A) SaaS (yes) (B) IaaS (C) MaaS (D) PaaS

Explanation:-

Software as a service,

Platform as a service,

Infrastructure as a service

***Identify the correct sequence in which the following packets are transmitted on the network by a host when a browser requests a webpage from a remote server, assuming that the host has just been restarted. (NET - DEC - 2018)***

(A) HTTP GET request, DNS query, TCP SYN

(B) DNS query, HTTP GET request, TCP SYN

(C) DNS query, TCP SYN, HTTP GET request(Yes)

(D) TCP SYN, DNS query, HTTP GET request

**Explanation: Step 1 :** Whenever the client request for a webpage, the query is made in the form say www.geeksforgeeks.org.

As soon as the query is made the server makes the DNS query to identify the Domain Name Space. DNS query is the process to identify the IP address of the DNS such as www.org. The client’s computer will make a DNS query to one of its internet service provider’s DNS server.

**Step 2 :** As soon as DNS server is located a TCP connection is to be established for the further communication. The TCP protocol requests the server to establishing a connection by sending a TCP SYN message. Which is further responded by the server using SYN\_ ACK from server to client and then ACK back to server from client (3- way hand shaking protocol).

**Step 3 :** Once the connection has been established the HTTP protocol comes into picture. It requests for the webpage using its GET method and thus, sending an HTTP GET request.

Hence, the correct sequence for the transmission of packets is

DNS query, TCP SYN, HTTP GET request.

***Which of the following statements are TRUE? (GATE – 2008 , NET – DEC – 2018 )***

(S1) TCP handles both congestion and flow control

(S2) UDP handles congestion but not flow control

(S3) Fast retransmit deals with congestion but not flow control

(S4) Slow start mechanism deals with both congestion and flow control

(A) S1, S2 and S3 only (B) S1 and S3 only

(C) S3 and S4 only (D) S1, S3 and S4 only

**Explanation:-**

(S1) TCP handles both congestion and flow control ⇒ True.

It uses congestion window for congestion control & Advertisement window for flow control

(S2) UDP does not handle congestion but also not handle flow control.

(S3) Fast retransmit deals with congestion but not flow control⇒ Yes.

Fast Retransmit is technique for detecting out of Order Datagram & Sending it.

It is congestion control technique and has no relation with Flow control

(S4) Slow start mechanism deals with both congestion and flow control ⇒ False.

It has nothing to do with Flow control. Flow control is taken care by Advertisement window.

Slow start is way Sender tries to gauge network capacity !

Answer (B) S1 and S3 only.

***You are designing a link layer protocol for a link with bandwidth of 1 sGbps (109 bits/second) over a fiber link with length of 800 km. Assume the speed of light in this medium is 200000 km/second. What is the propagation delay in this link? (NET 2019 - JULY)***

a)1 millisecond b)2 milliseconds c)3 milliseconds d)4 milliseconds

**Explanation**

Propagation delay : Time taken by the first bit to travel from sender to receiver end of the link.

Propagation delay = distance/speed of the medium = d/s

Propagation delay = 800km/200000km/sec

=(800/200000)sec

=(800/200)milliseconds

=4 milliseconds

***Which one of the following uses UDP as the transport protocol? (Gate 2007)***

(A) HTTP (B) Telnet (C) DNS(yes) (D) SMTP

***Explanation:***

UDP is a stateless ,connectionless and unreliable protocol.

HTTP needs connection to be established and thus,uses TCP.

Telnet is a byte stream protocol which again needs connection establishment ,thus uses TCP.

DNS needs request and response ,it needs a protocol in which a server can answer the small queries of large number of users. As UDP is fast and stateless it is the most suitable protocol and thus,it is used in DNS querying .

SMTP needs reliability and thus,uses TCP.

DNS uses UDP.

HTTP, Telnet and SMTP uses TCP.

Thus, C is the correct choice.

***For which one of the following reasons does Internet Protocol (IP) use the time-to-live (TTL) field in the IP datagram header (Gate - 2006)***

(A) Ensure packets reach destination within that time

(B) Discard packets that reach later than that time

(C) Prevent packets from looping indefinitely(yes)

(D) Limit the time for which a packet gets queued in intermediate routers.

***In a classful addressing, the IP addresses with 0 (zero) as network number : (Dec-2015)***

(A) refers to the current network (yes) (B) refers to broadcast on the local network

(C) refers to broadcast on a distant network (D) refers to loopback testing

**Four bits are used for packed sequence numbering in a slinding window protocol used in a computer network. What is the maximum window size? (UGCNET-June2014-III: 72)**

a) 4 b) 8 c) 15(yes) d) 16

**Explanation1** : 4 bit possible window size 16(0,1,2.....,15). but due to ambiguity we left one sequence number.

**Explanation2**: Sliding window is of two types:

'1.) Go Back N

2.) Selective Repeat

if we consider here Go Back N, then ans would be 15 as window size= (2^k)-1 i.e. (2^4)-1=16-1=15

but if we consider Selective Repeat then ans would be 8 as window size= 2^(k-1) i.e. 2^(4-1)=2^3=8

so why we considering here only Go Back N only, not Selective Repeat.. ?

**OTHER QUESTIONS**

***If the hamming distance between the data word and the corresponding code word is 5 then\_\_\_\_\_\_\_\_\_\_ numbers of bits are corrupted during transmission. (WB-SET-2020)***

(A) 2 (B) 4 (C) 5(yes) (D) 6

**Explanation:-** Because the Hamming distance between two words is the number of differences between corresponding bits.

***The minimum frame length for 10 Mbps Ethernet is \_\_ bytes and maximum is \_\_ bytes. (NET -2014 – JUNE –PII)***

(A) 64 & 128 (B) 128 & 1518 (C) 1518 & 3036 (D) 64 & 1518(yes)

***A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts it can handle ? (2014 - June)***

(A) 1024 (B) 2048 (C) 4096 (D) 8192

***A terminal multiplexer has six 1200 bps terminals and ‘n’ 300 bps terminals connected to it. If the outgoing line is 9600 bps, what is the value of n? (2014-June)***

(A) 4 (B) 8 (yes) (C) 16 (D) 28

Explanation:-

Since there are six 1200bps terminals, 6\*1200 + n\*300 =9600 by solving this, n=8.

***Ten signals, each requiring 3000 Hz, are multiplexed on to a single channel using FDM. How much minimum bandwidth is required for the multiplexed channel? Assume that the guard bands are 300 Hz wide. (2014 - June)***

(A) 30,000 B) 32,700(yes) (C) 33,000 (D) None of the above

Explanation:-

Ten signals need 10x3000 =30000 Hz

9 (10-1) Guard bands (or gaps) needs =300x9 =2700 Kz

so minimum bandwidth need 30000+2700= 32700Hz

***\_\_\_\_\_\_\_\_\_ is a bit-oriented protocol for communication over point-to-point and multipoint links.(2014-Dec)***

(A)Stop-and-wait (B)HDLC(yes) (C)Sliding window (D)Go-back-N

***Which one of the following is true for asymmetric-key cryptography ? (2014 - Dec)***

(A) Private key is kept by the receiver and public key is announced to the public.(yes)

(B) Public key is kept by the receiver and private key is announced to the public.

(C) Both private key and public key are kept by the receiver.

(D) Both private key and public key are announced to the public.

***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? (Dec - 2014)***

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

**Explanation:** We know that 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.

***Suppose we want to download text documents at the rate of 100 pages per second. Assume that a page consists of an average of 24 lines with 80 characters in each line. What is the required bit rate of the channel? (NET - Nov - 2017)***

(A) 192 kbps (B) 512 kbps (C) 1.248 Mbps (D) 1.536 Mbps(ye)

**Explanation:** We have 100 pages, each page is having 24 line and in each line there are 80 character and each character is of 8 bits.

Now we have to calculate no of bits can be downloaded:

Downloading rate = 100 pages

= 100 pages \*24 line \* 80 character \* 8 bits

= 1536000 bits per second

ie 1.536 Mbps.

So, option (D) is correct.

***Assume that we need to download text documents at the rate of 100 pages per minute. A page is an average of 24 lines with 80 characters in each line and each character requires 8 bits. Then the required bit rate of the channel is \_\_\_\_\_. (NET- July - 2016)***

(A) 1.636 Kbps (B) 1.636 Mbps (C) 3.272 Mbps (D) 25.6 Kbps(yes)

**Explanation:** 100 pages , each page contain 24 line, each line have 80 character and each character weighted 8 bit, we have to download 100 pages per minute.

i.e. 100 \* 24 \* 80 \* 8 / 60 = 25.6 kbps.

***Hamming distance between 100101000110 and 110111101101 is (NET-2013-P3)***

a)3 b)4 c)5 d)6(yes)

**Explanation:** Hamming distance between 100101000110 and 110111101101 is = no of 1's in 100101000110 XOR 110111101101 = 6.

**SUBNETTING AND MASK**

**Consider the following subnet masks-**

1)255.0.0.0 2)255.128.0.0 3)255.192.0.0

4)255.240.0.0 5)255.255.0.0 6)255.255.254.0

7)255.255.255.0 8)255.255.255.224 9)225.255.255.240

For each subnet mask, find-

a)Number of hosts per subnet

b)Number of subnets if subnet mask belongs to class A

c)Number of subnets if subnet mask belongs to class B

d)Number of subnets if subnet mask belongs to class C

e)Number of subnets if total 10 bits are used for the global network ID

Explanation:-

<https://www.gatevidyalay.com/subnet-mask-ip-subnet-mask-problems/>

***Given IP Address – 172.16.0.0/25, find the number of subnets and the number of hosts per subnet. Also, for the first subnet block, find the subnet address, first host ID, last host ID and broadcast address.***

**Solution** : This is a class B address. So, no. of subnets = 2(25-16) = 29 = 512.

No. of hosts per subnet = 2(32-25) – 2 = 27 – 2 = 128 – 2 = 126

For the first subnet block, we have subnet address = 0.0, first host id = 0.1, last host id = 0.126 and broadcast address = 0.127

***If a class B network on the Internet has a subnet mask of 255.255.248.0, what is the maximum number of hosts per subnet?***

(A) 1022 (B) 1023 (C) 2046(yes) (D) 2047