**Network layer Tutorial Revision**

1.What is the function of the address resolution protocol (ARP)?
2.ARP request is broadcast and ARP reply is _____.
3.What does DHCP issue to the client?
4.What is DHCP is used for?
5. What are the functions of The DHCP server?
6.During error reporting, ICMP always reports error messages to which node? Source or Destination?
7.Which of these is not a type of error-reporting message?
A. Destination unreachable
B. Source quench
C. Router error
D. Time exceeded
8. The TTL field has value 13. How many routers (max) can process this datagram?
9. What should be the flag value M to indicate the last fragment?
10. Which field helps to check rearrangement of the fragments in IPv4?
11. If the value in protocol field is 2, which protocol should be used in IPv4 header?
12. Which one fields of an IP header cannot be modified by a typical IP router?
13. What is the size of the header checksum field in IPv4 header (in bytes)?
14. Name the fields that are related to fragmentation and reassembly of an IPv4 datagram?
15. A router receives an IPv4 packet with the flag values D=0 and needs to do fragmentation because of smaller MTU on the outgoing interface. What does the router do?

**//NAT and IPv6 Tutorial Revision**

1.What is The maximum number that IPv4 addresses can have?
2. What are the limitations of IPv4 addresses?
3.Which of the following is incorrect about Network Address Translation (NAT)?
A. NAT is a process in which one or more local IP address is translated into one or more Global IP address and vice versa.
B. NAT results in switching path delays.
C. Certain applications will not function while NAT is enabled
D. Routers will do NAT translations without configuration.

4. What is the other name for Port Address Translation (PAT)?

5.In _____ type of NAT, one or more private IP addresses can be mapped to one public IP address.
A. Static NAT
B. Dynamic NAT
C. PAT
Explanation
Port Address Translation (PAT) is an extension of Network Address Translation (NAT) that permits multiple devices on a LAN to be mapped to a single public IP address to conserve IP addresses.

D. None of the above

*Answer is C and is explained for your understanding.*

6.Which of the following is incorrect about NAT?
A. NAT does not conserve IPv4 addresses.
B. Static NAT creates a fixed translation of private addresses to public addresses
C. Static NAT allows the user to configure one-to-one translations.

D. NAT helps to reuse private IP addresses

7. What is the fixed base header length of an IPv6 datagram?
8. The traffic class field of IPv6 is similar to which field in the IPv4 header?
9. What are the type of addresses supported by IPv6?
10. Which field determines the lifetime of IPv6 datagram?
11. What is the size of an IP address in IPv6?
12. Which of the following is incorrect about IPv6 header format?

A. Version field is of 4 bits.
B. Flow Label field is of 20 bits.
C. Next Header field is of 16 bits.

D. Payload length field is of 16 bits

13. Which of the following is NOT correct about IPv6 address?
A. IPv6 supports real time applications.
B. IPv6 has increased address space when compared to IPv4.
C. IPv6 cannot be routed on IPv4 networks.

D. IPv6 has improved packet handling.

14. Which of the following is an incorrect IPv6 address?
A. 2001::1
B. FE80:0000:0000:0:0123:4567:89AB:CDEF:1010
C. 2003:DEAD:CAFE:cafe:ab33:46:abab:62

D. 2003:dead:bef:4dad:ab33:46:abab:62

***NB: Explanation***
***An IPv6 address has 8 hextets represented in hexa-decimal. Hextet is used to refer to a segment of 16 bits or four hexadecimals and IPv6 addresses can be written in either lowercase or uppercase. (::) is used to represent contiguous 0s.***

15. Which of the following is an incorrect IPv6 address?
A. FE80:FE80::1
B. 2001::CAFE
C. 2001:0DB8::ABCD::1234
D. 2001:DB8:0:0:ABCD: :100

NB: Explanation
(::) is used to represent contiguous 0s but it can appear only once in a valid IPv6 address.

16. List the functions/services offered by the network layer?
17. In _____ routing, the routing tables are updated periodically and the routing tables are not manually updated by the network administrator.

**//Application layer and security**

1. The Protocol Data Unit (PDU) for the application layer in the Internet stack is known as?
2. Which protocol resolves the internet names?
3. Identify the correct order in which the following actions take place in an interaction between a web browser and a web server.
1. The web browser requests a web page using HTTP.
2. The web browser establishes a TCP connection with the web server.
3. The web server sends the requested web page using HTTP.
4. The web browser resolves the domain name using DNS.

A. 4, 2, 1, 3
B. 1, 2, 3, 4
C. 4, 1, 2, 3
D. 2, 4, 1, 3

5. Which application-level protocol in which a manager control a set of agents?

A. HTML

B. TCP

C. SNMP

D. SCTP

**NB: Explanation for SNMP. Also check how others function.**

SNMP stands for Simple Network Management Protocol. SNMP is an Internet Standard protocol for collecting and organizing information about managed devices on IP networks and for modifying that information to change device behavior. SNMP follows Agent-Manager

model. Devices that typically support SNMP include cable modems, routers, switches, servers, workstations, printers, and more. It is an application-level protocol in which a SNMP manager stations control a set of SNMP agents.

6. Which of the following features has been enhanced in SNMPv3 when compared to SNMPv2?

A. Management
B. Integration
C. Classification
D. Security

*NB: Explanation for above*
*SNMPv3 has introduced new cryptographic security features such as confidentiality, authentication, and integrity. Confidentiality in SNMPv3 ensures data packets are encrypted and also ensures privacy. Authentication in SNMPv3 ensures that the message is coming from a reliable source. Integrity feature in SNMPv3 prevents unauthorized modification of data packets. Hence option (d) is correct.*

7. Which of the following is true about HTTP and HTTPS?
(i) HTTP is unsecured while HTTPS is secured.
(ii) HTTP sends data over port 80 while HTTPS uses port 443.
(iii) No SSL certificates are required for HTTP, with HTTPS it is required that we have an SSL certificate and it is signed by a Certificate Authority (CA).

A. (i) only
B. (i) and (iii) only
C. (i) and (ii) only
D. (i), (ii) and (iii)

8. List the E-mail protocols?
9. Consider different activities related to email: Identify the application-level protocol used in each activity below?
m1: Send an email from a mail client to a mail server
m2: Download an email from mailbox server to a mail client
m3: Checking email in a web browser

10. Which transport layer protocol is used to support electronic mail?
11. The port numbers of the application layer protocols HTTP and HTTPS are _____ and _____respectively.

**//Network Security**

1. Define Cryptography in full?
2. Which cryptographic type uses same key for encryption and decryption?

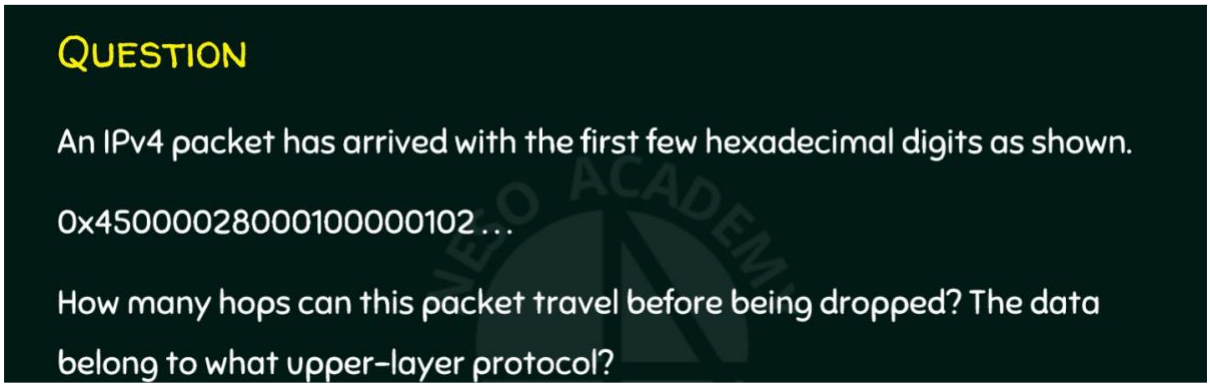
3. Which cryptographic type uses unique keys for encryption and decryption?
4. Describe Ciphertext and Plaintext ?
5. In security, CIA stands for

**NB: Explanation for your understanding**
Confidentiality, Integrity and Availability, also known as the CIA triad, is a model designed to guide policies for information security within an organization. The model is also sometimes referred to as the AIC triad (availability, integrity and confidentiality) to avoid confusion with the Central Intelligence Agency. The elements of the triad are considered the three most crucial components of security. Hence option (a) is correct.

6.List the private and public key encryption algorithms?

**//TTL solved Problems**

Question 1




**Network layer solved questions**

Question 1:

**QUESTION**

In an IPv4 packet, the value of HLEN is 5, and the value of the total length field is 0x0028. How many bytes of data are being carried by this packet?

**QUESTION**

An IPv4 packet has arrived with the first 8 bits as shown: 01000010. The receiver discards the packet. Why?

**//Fragmentation and MTU**

**QUESTION**

Consider an IP packet with a length of 3000 bytes is forwarded to an IPv4 router that supports a Maximum Transmission Unit (MTU) of 500 bytes.

a. Find the number of fragments.
b. Details of all fragments with M flag, Offset and Total length.

**QUESTION**

Consider an IP packet with a length of 4,500 bytes that includes a 20-byte IPv4 header and 40-byte TCP header. The packet is forwarded to an IPv4 router that supports a Maximum Transmission Unit (MTU) of 600 bytes. Assume that the length of the IP header in all the outgoing fragments of this packet is 20 bytes. Assume that the fragmentation offset value stored in the first fragment is 0. The fragmentation offset value stored in the third fragment is ____ .

## QUESTION

In an IPv4 datagram, the M bit is 0, the value of HLEN is 10, the value of total length is 400 and the fragment offset value is 300. The position of the datagram, the sequence numbers of the first and the last bytes of the payload, respectively are

## QUESTION

Host A sends a UDP datagram containing 8880 bytes of user data to host B over an Ethernet LAN. Ethernet frames may carry data up to 1500 bytes (i.e. MTU = 1500 bytes). Size of UDP header is 8 bytes and size of IP header is 20 bytes. There is no option field in IP header. How many total number of IP fragments will be transmitted and what will be the contents of offset field in the last fragment?

**//Extra questions on NAT and IPv6**

## QUESTION 1

Does IPv6 require NAT?

## QUESTION 2

Which of the following are disadvantages of using NAT?

1. Translation introduces switching path delays.
2. Conserves legally registered addresses.
3. Causes loss of end-to-end IP traceability.
4. Increases flexibility when connecting to the Internet.
5. Certain applications will not function with NAT enabled.
6. Reduces address overlap occurrence.

## QUESTION 3

Which of the following would be good reasons to run NAT?

1. You need to connect to the Internet and your hosts don't have globally unique IP addresses.
2. You change to a new ISP that requires you to renumber your network.
3. You don't want any hosts connecting to the Internet.
4. You require two intranets with duplicate addresses to merge.

Check the solution on solved questions.

## QUESTION 3

The MAC address of host is 0200 : 1234 : 5678 and the initial prefix learned by the router's RA message is 2000 : 1234 : 5678 : : /64 . What is the resulting IPv6 host address?

## QUESTION 4

Stateful DHCP does not track what information is given out to clients and does not give out IPv6 addresses.

**//Ethernet**

## QUESTION

Determine the maximum length of the cable (in km) for transmitting data at a rate of 500 Mbps in an Ethernet LAN with frames of size 10,000 bits. Assume the signal speed in the cable to be 2,00,000 km/s.

## QUESTION

A network with CSMA/CD protocol in the MAC layer is running at 1 Gbps over a 1 km cable with no repeaters. The signal speed in the cable is $2 \times 10^8$ m/sec. The minimum frame size for this network should be

**QUESTION**

What is the propagation time if the distance between the two points is 12,000 km? Assume the propagation speed to be $2.4 \times 10^8$ m/s in cable.

Consider that the link capacity of a channel is 512kbps and the round trip delay time is 1000ms. What will be the Bandwidth Delay Product for this channel?

**//Flow control, Please check other solved questions from the notes.**

Station A uses 32 byte packets to transmit message to Station B using a sliding window protocol. The round trip delay between A and B is 80 milliseconds and the bottleneck bandwidth on the path between A and B is 128 kbps. What is the optimal window size that A should use?