Information and Technology – Competency 6

(Past papers 2011 - 2021)

No - 05

2011 A/L

1. The abbreviation GSM stands for
   1) Global System for Mobile Access
   2) Global System for Mobile Communication
   3) Global System for Mobile Phone
   4) Global System for Mobile Transmission
   5) Global System for Mobile Interconnection

2. The main role of a "router" in computer network is
   1) To broadcast data packets to all hosts in the network.
   2) To monitor the network for malicious activities.
   3) To retransmit the received signal at a higher power.
   4) To allow hosts in two networks to communicate.
   5) To allow load balancing between multiple separate networks.

3. A command that can be used to check network connectivity to a computer is
   1) ipconfig
   2) ping
   3) traceroute
   4) netstat
   5) hostname

4. What is the main function of a DHCP server?
   1) Allocating IP addresses.
   2) Resolving domain names from IP addresses.
   3) Providing directory services to users.
   4) Sharing an Internet connection among users.
   5) Protecting a computer network from virus attack.

5. Consider the IP address 192.248.87.3 and subnet mask 255.255.255.224. How many hosts can be directly connected to this network?
   1) 16
   2) 24
   3) 30
   4) 64
   5) 128

6. What is the most suitable media to transmit a high-definition video over a distance of 5 km?
   1) Radio waves
   2) Twisted pair copper cables
   3) Fiber optics cables
   4) Coaxial cables
   5) Open wire cables

7. The transport layer of the OSI reference model provides
   1) Error correction.
   2) Routing of data packets.
   3) Flow control.
   4) Process – process communication.
   5) Error detection.

2012 A/L

8. In computer networks, acronym DHCP stands for
   1) Dynamic Host Control Protocol.
   2) Dynamic Host Configuration Protocol.
   3) Domain Host Configuration Protocol.
   4) Dynamic Host Configuration Practice.
   5) Dynamic Host Control Parameters.

9. What is the function of a DNS in a Computer Network?
   1) Assigns IP addresses
   2) Translates domain names to IP addresses
   3) Protects a network from viruses
   4) Provides directory services to users
   5) Connects multiple computer networks together

10. The command that can be used to check the network configuration of a computer is
    1) traceroute.
    2) netstat.
    3) hostname.
    4) ipconfig.
    5) ping.

11. Which of the following statements is correct about IP addresses and subnet masks?
    1) 192.248.32.3 is a Class B IP address.
    2) A network with a subnet mask 255.255.255.248 can accommodate six hosts.
    3) An IP address consists of 16 bits.
    4) 10.32.1.5 is a class C IP address.
    5) 255.255.255.0 is a class C IP address.

12. The network layer of the OSI reference model provides
    1) Error correction
    2) Inter-process communication
    3) Flow control
    4) Routing of data packets
    5) Error detection

13. Which of the following is most cost effective and secure in transmitting private and confidential messages and notices among the employees of an organization?
    1) Electronic notice boards
    2) Teleconferencing
    3) e-mail
    4) A social network
    5) A website

2013 A/L

14. What is the main function of a PROXY server in internet communication?
    1) Allocate and release IP addresses
    2) Translate domain names to IP addresses
    3) Protect a network from viruses
    4) Provide printing services to users
    5) Share an internet connection among several computers

15. An organization has been allocated a Class C IP address range having a subnet mask of 255.255.255.0. If the organization is to setup a web server and an email server, what are the IP addresses that can be allocated to these two servers?
    1) 192.248.87.2, 192.248.32.3
    2) 192.248.87.4, 192.248.87.5
    3) 192.248.32.3, 192.248.33.3
    4) 192.248.40.2, 192.248.41.3
    5) 192.248.87.1, 192.248.60.2

16. In communication networks, ISDN stands for
    1) Integrated Service Domain Name.
    2) Integrated Service Directory Name.
    3) Integrated Service Digital Network.
    4) Internet Service Digital Network.
    5) Integrated Service Domain Network.

17. In the OSI reference model, detection of errors during communication between two computers in a network is a function of the ……
    1) Physical layer.
    2) Data link layer.
    3) Network layer.
    4) Transport layer.
    5) Application layer.

18. The command that can be used to login to a remote computer through a network is
    1) ipconfig.
    2) ftp.
    3) telnet.
    4) tracert.
    5) route.

19. Which of the following devices can be used to connect two physical networks having IP addresses 72.110.0.0 (subnet mask 255.255.0.0) and 192.248.10.0 (subnet mask 255.255.255.0)?
    1) Hub
    2) Repeater
    3) Switch
    4) Router
    5) Multiplexer

2014 A/L

20. Which of the following converts digital data to analog data to transmit over an analog telephone network?
    1) Network Interface Card (NIC)
    2) Modem
    3) Multiplexer
    4) Bluetooth adapter
    5) Wi-Fi card

21. A special digit inserted into a sequence of digits for data validation is called the …….. digit. Which of the following is most appropriate to fill the blank in the above statement?
    1) Check
    2) Sign
    3) Least significant
    4) Most significant
    5) Error

22. Computers attached to a LAN use the default gateway connected to the same network
    1) To translate the domain names to IP addresses.
    2) To forward IP packets when they do not know any specific route to the destination.
    3) As the firewall for the network.
    4) To send all the data packets to other computers in the same LAN.
    5) To assign IP address to a computer on the LAN.

23. The command that can be used to measure the round-trip propagation delay between two computers on the Internet is
    1) ping.
    2) ipconfig.
    3) ssh.
    4) ftp.
    5) telnet.

24. In the OSI seven-layer reference model, IP protocol maps to the ……layer. Which of the following is most appropriate to fill the blank in the above statement?
    1) Application
    2) Session
    3) Transport
    4) Network 5) Physical

25. The function of the DHCP server in an IP network is to
    1) Translate domain names to IP addresses.
    2) Cache the web pages.
    3) Dynamically allocate IP addresses.
    4) Filter IP packets.
    5) Provide security.

26. Which of the following is a valid subnet mask?
    1) 255.255.255.192
    2) 255.0.255.0
    3) 256.255.255.64
    4) 255.256.255.96
    5) 0.0.0.255

27. The ping command indicates that there is a 5% packet loss between the computers X and Y. There is an FTP server running on Y. A file is downloaded to X from Y using FTP protocol. Which of the following is the most appropriate statement regarding this file download?
    1) The downloaded file has exactly 5% of the data missing.
    2) The downloaded file has more than 5% of the data missing.
    3) The downloaded file has 5% of data in a different order than the original file.
    4) The downloaded file has the data in exactly the same order as the original file.
    5) FTP protocol cannot run on a network connection with errors.

2015 A/L

28. …….. is used for analog signal to digital signal conversion. Which of the following is most appropriate to fill the blank in the above statement?
    1) Amplitude Modulation (AM)
    2) Frequency Modulation (FM)
    3) Pulse Code Modulation (PCM)
    4) Phase Modulation (PM)
    5) Time Division Modulation (TDM)

29. A computer in a network is configured with the IP address 192.248.16.91 and the subnet mask 255.255.255.128. Which of the following IP addresses **cannot** be assigned to a computer in the same network?
    1) 192.248.16.161
    2) 192.248.16.78
    3) 192.248.16.110
    4) 192.148.16.75
    5) 192.248.16.120

30. Which of the following statements is correct with respect to the Transmission Control Protocol (TCP)?
    1) TCP is a network layer protocol.
    2) TCP guarantees that each byte sent is received at the receiver.
    3) Only one application at a time can use TCP in a computer.
    4) HTTP uses TCP.
    5) TCP uses User Datagram Protocol (UDP) as the transport protocol.

31. A LAN uses the subnet mask 255.255.240.0. How many different IP addresses can be assigned to devices in this LAN?
    1) 254
    2) 256
    3) 1024
    4) 2046
    5) 4094

32. Which of the following statements is correct with respect to routing in the Internet?
    1) There can be at most one router in any given LAN.
    2) A router can have more than one network interface.
    3) Routing is a functionality of the Transport Layer.
    4) All routers function as HTTP proxies.
    5) The Internet does not need routing if all applications use TCP.

33. In a public key encryption system, the private key of a person x is given by the function priv(x) and the public key is given by pub (x). Consider the following statements:
    A. Pub(x) is used to encrypt a message that can only be decrypted using priv(x).
    B. Pub(x) is used to sign a message to be sent to x.
    C. A message encrypted using pub(x) can be decrypted using pub(x).

    Which of the above statement(s) is/are correct?

1) A only
2) B only
3) C only
4) A and B only
5) B and C only

33. Consider the following statements regarding a server with the domain name www.bogus.lk:
    A. The server www.bogus.lk can be located anywhere in the world.
    B. www.bogus.lk must be a server.
    C. The domain names www.bogus.lk and www.bogus.com can be resolved to the same IP address.

    Which of the above statement(s) is/are correct?

1) A only
2) B only
3) C only
4) A and B only
5) A and C only

34. A file of 1MB has been successfully sent from the machine X to machine Y in a network over a TCP connection. It has been observed that the 10^{th} byte of the file has passed through the router R. Consider the following statements regarding this communication:
    A. The $10{,}000^{th}$ byte must have gone through the router R after the 10^{th} byte.
    B. The $10{,}000^{th}$ byte must have gone through the same path from X to Y as the 10^{th} byte.
    C. The $10{,}000^{th}$ byte may or may not have gone through the router R.

    Which of the above statement(s) is /are correct?

1) A only
2) B only
3) C only (4) A and B only (5) B and C only

2016 A/L

35. "An analog signal is sampled at regular intervals and represented as 16-bit values." Which of the followings is best described by the above statement?
    1) Amplitude Modulation (AM)
    2) Frequency Modulation (FM)
    3) Pulse Code Modulation (PCM)
    4) Phase Modulation (PM)
    5) Pulse Width Modulation (PWM)

36. Two machines with the IP addresses 192.248.16.30 and 192.248.16.90 are connected to a Local Area Network (LAN). Which of the followings is a suitable subnet mask for this network?
    1) 192.255.255.255
    2) 192.248.16.0
    3) 255.255.255.224
    4) 255.255.255.128
    5) 255.255.255.255

37. Which of the following is a correct IPV4 address?
    1) 192.248.0.0.1
    2) 192.258.2.1
    3) 8.8.8.8
    4) 10.256.8.9
    5) 255.255.255.268

38. User Datagram Protocol (UDP) is a ……Layer protocol. Which of the following layers is the most suitable to fill the blank in the above statement?
    1) Physical
    2) Data link
    3) Network
    4) Transport
    5) Application

39. Consider the following statements regarding routing in IP networks:
    A. All router must use a DNS server for IP packet forwarding.
    B. Routers must forward all receiving IP packets along the same path.
    C. A router may discard an IP packet.
    Which of the above statements is / are correct?
    1) A only
    2) B only
    3) C only
    4) A and B only
    5) B and C only

39. In a public key cryptographic system, the private key of a person x is given by the function priv(x) and the public key is given by the function pub(x). Consider the following statements:
    A. priv(x) and pub (x) should be the same for better security.
    B. A message encrypted using pub(x) can be decrypted using pub (x).
    C. The person x knows both priv(x) and pub(x).
    Which of the above statements is/are correct?

    1) A only
    2) C only
    3) A and B only
    4) A and C only
    5) B and C only

40. Local Area Network (LAN) has 500 network devices. What is the most appropriate subnet mask for this computer network?
    1) 255.255.255.0
    2) 255.255.255.128
    3) 255.255.255.192
    4) 255.255.255.224
    5) 255.255.254.0

2017 A/L

41. In electronic mail systems, the protocol used by mail clients to retrieve messages from the mail server is
    1) Simple Mail Transfer Protocol (SMTP).
    2) File Transfer Protocol (FTP).
    3) Internet Control Message Protocol (ICMP).
    4) Internet Message Access Protocol (IMAP).
    5) Telnet.

42. The transport layer protocol User Datagram Protocol (UDP) can be used for
    1) reliable communication.
    2) guaranteed delivery.
    3) connection oriented communication.
    4) ordered delivery.
    5) exchanging state information among routers.

43. Which of the following statements regarding MAC addresses is correct?
    1) Every network device has a unique MAC address.
    2) Every network host has a unique MAC address.
    3) Every network interface has a unique MAC address.
    4) It is assigned for a device at the time of installation.
    5) It is used for routing.

44. The first and the last IP addresses of a subnet are 192.192.48.0 and 192.192.63.255 respectively. Which of the followings is the subnet mask of this subnet?
    1) 255.255.255.0
    2) 255.255.192.0
    3) 255.255.255.192
    4) 255.255.240.0
    5) 255.240.0.0

45. 172.16.48.200/24 is a
    1) Host address in a class B network.
    2) Network address of a class C network.
    3) Host address in 172.16.48.0/24 subnet.
    4) Network address of a subnet with 255 hosts.
    5) Host address with 8 network bits.

46. In TCP/IP computer networks, Transport Protocol Data Unit(TPDU) is referred to as a
    1) Packet.
    2) Frame.
    3) Segment.
    4) Window.
    5) Message.

2018 A/L

47. Consider the following statements.
    A. In public key encryption systems, each pair of communicating entities share a single key for encryption and decryption.
    B. Phishing is a type of social engineering attack often used to steal user data such as user name and password.
    C. Port scanning is a method which can be used by attackers to identify open ports or services on a network host.
    D. Digital signatures can be used for email message authentication.

    Which of the above statements are correct?

    1) B and C only
    2) A, B and C only
    3) A, C and D only
    4) B, C and D only
    5) All A, B, C and D

48. Consider the following statements.
    A. DHCP server in an IP network dynamically allocates IP addresses to network devices.
    B. DNS server translates domain names to a IP addresses.
    C. FTP server caches the recently accessed web pages.

    Which of the above statements is /are correct?

    1) A only
    2) B only
    3) A and B only
    4) B and C only
    5) All A, B and C

49. Consider the following statements.
    A. TCP is a connection oriented and a reliable protocol.
    B. UDP is a connectionless and an unreliable protocol.
    C. TCP and UDP are transport layer protocols.

    Which of the above statements is/are correct?

    1) A only
    2) B only
    3) A and B only
    4) B and C only
    5) All A, B and C

49. In the OSI reference model, the network layer is responsible for …… communication. Which of following is suitable to fill the blank in the above statement?
    1) node to node
    2) source to destination
    3) hop to hop
    4) switch to router
    5) process to process
50. Which of the following indicates the number of host bits and the number of IP addresses respectively in a class C network?
    1) 8 and 256
    2) 8 and 65536
    3) 16 and 256
    4) 16 and 65536 (5) 24 and 256

51. To which of the following network classes does the IP address 192.248.254.1 belong?
    1) A
    2) B
    3) C
    4) D
    5) E

52. In the OSI reference model, a protocol data unit of the network layer is referred to as a ……. . Which of the following terms is suitable to fill the blank in the above statement?
    1) Frame
    2) Segment
    3) Window
    4) Message
    5) Packet

2019 A/L

53. Use of public key and private key in encryption and decryption processes is called
    1) asymmetric encryption.
    2) digital encryption.
    3) hybrid encryption.
    4) private key encryption.
    5) symmetric encryption.

54. In a particular network, each node is connected directly to a central network device. This topology is referred to as a
    1) bus.
    2) hybrid.
    3) mesh.
    4) ring.
    5) star.

55. Which of the following are the properties of signal?
    1) Amplitude, Clock time, Frequency and Wavelength
    2) Amplitude, Frequency, Phase and Time
    3) Amplitude, Frequency, Phase and Wavelength
    4) Amplitude, Frequency, Time and Wavelength
    5) Amplitude, Impulse, Phase and Wavelength

56. Which of the following options contains only guided media?
    1) Coaxial, Fiber optics and Infrared
    2) Coaxial, Fiber optics and Microwave
    3) Coaxial, Fiber optics and Twisted pair
    4) Coaxial, Infrared and Twisted pair
    5) Fiber optics, Satellite communication and Twisted pair

57. The frequency modulation technique is used to change only
    1) The amplitude and frequency.
    2) The amplitude, frequency and phase.
    3) The amplitude and phase.
    4) The frequency.
    5) The frequency and phase.

58. Consider the following statements:
    A. A hub connects only the networked computers but a switch connects multiple devices.
    B. A switch manages the ports and the VLAN security settings.
    C. In data transmission, a hub uses bits while a switch uses frames and packets.
    D. The data transmission speed in a hub is higher than that in a switch.

    Which of the above statements are correct?

    1) A, B and C only
    2) A, B and D only
    3) A, C and D only
    4) B, C and D only
    5) All A, B, C and D

59. Consider the following statements about the proxy server.

A. It helps to hide the true IP address.
B. It is used to restrict the access of the website in the network.
C. It uses the cached data for the quick loading of regularly accessed websites.
D. It helps to detect the locations of the visitors and load web pages as per their needs.

Which of the above statements are correct?

1) A, B and C only
2) A, B and D only
3) A, C and D only
4) B, C and D only
5) All A, B C and D

2020 A/L

60. Which of the following statements regarding guided and unguided media are correct?

A. Guided media transmission supports higher data speeds than unguided media transmission.
B. Guided media is subjected to less interference than unguided media.
C. Unguided media transmission is more secure than guided media transmission.
D. Unguided media transmission uses low bandwidth than guided media transmission.

1) A, B and C only
2) A, B and D only
3) A, C and D only
4) B, C and D only
5) All A, B, C and D

61. What is the process carried – out in the modulation technique in data transmission?

1) Encoding information in transmitted signal
2) Encoding signals in transmitted information
3) Extracting information from the transmitted signals
4) Extracting information from the transmitted information
5) Transfer information with minimum distortion

62. Which of the following statements about bus topology are incorrect?

A. Computers and network devices are connected to a signal cable.
B. All traffic flows are either clockwise or anticlockwise.
C. Bandwidth is shared among the nodes.
D. Each node is connected to two of its neighbors.

1. A and B only
2. A and D only
3. B and C only
4. B and D only
5. C and D only

63. Consider the following statement with a blank.

A Media Access Control (MAC) address a usually represented in …… numbers. Which of the following is suitable to fill the blank?

1) Binary
2) Decimal
3) Hexadecimal
4) Natural
5) Octal

64. You are requested to create 16 subnets with a class C IP. Which subnet mask is suited to create the subnet?

1) 255.255.255.240
2) 255.255.255.248
3) 255.255.255.250
4) 255.255.255.252
5) 255.255.255.224

2021 A/L

65. Which of the following is/are correct with respect to a *digital signal*?

A. Denoted by s square wave
B. Contains a continuous range of values
C. Uses discrete values to represent information

1) A only
2) B only
3) C only
4) A and B only
5) A and C only

66. Which of the following is/are correct with respect to *guided media* used for data transmission?

A. A physical path is used for data transmission
B. Signal is broadcast through air
C. Example: radio waves

1) A only
2) A and B only
3) A and C only
4) B and C only
5) All A, B and C only

67. Which of the following could be used to digitally represent analog signals?

1) Attenuation
2) Decoding
3) Distortion
4) Pulse code modulation
5) Synchronization

68. Read the following sentences:

When devices send and receive data over a network, a protocol is used uniquely identify the sender interface and the correct delivery of the data to the receiver's interface. What is the protocol that the writer in above sentence is referring to?

1) FTP
2) HTTP
3) MAC
4) TCP
5) UDP

69. Given below are some characteristics of Transmission Control Protocol (TCP) and User Datagram Protocol (UDP):

A. Best suited for applications that need high reliability and where the transmission time is less critical
B. Faster and requires fewer resources
C. Guarantees that no packets are missing
D. Packets may not arrive in order
E. Used for voice communications over internet

Which of the above are the characteristics of UDP?

1) A, B and C only
2) A, C and E only
3) A, D and E only
4) B, C and D only
5) B, D and E only

70. Which of the following is/are examples for the use of the client – server model?

A. A user printing a document using a printer connected to her computer.
B. A bank customer accessing online banking services with a web browser
C. A cashier of a shop that accepts payments by credit cards.

(1) A only
(2) B only
(3) C only
(4) A and C only
(5) B and C only

71. Sender A wants to used the message HELLO to receiver B. Before sending the message, it is converted to IFMMP. Which of the following is correct with respect to this scenario?
    A. HELLO is the *plaintext* while IFMMP is the *ciphertext*.
    B. IFMMP is the result of applying the ASCII code to HELLO.
    C. +1 is the *encryption key* while -1 is the *decryption key*.

    (1) A only
    (2) A and B only
    (3) A and C only
    (4) B and C only
    (5) All A, B and C only

72. Consider the following paragraph with three blanks labelled A, B and C.

When there are multiple computers in an office, each computer can be given a private IP address. The router in the office gets a ……A…… Ip address, and each of the computers connected to that router through guided/unguided media gets a private IP address from the ……..B……. via the ……..C……. protocol.

Which of the following is the correct combination for the blanks A, B and C?

    (1) A – private, B - file server, C - HTTP
    (2) A – private, B - internet, C - DHCP
    (3) A – private, B - router, C - FTP
    (4) A – public, B - file server, C - FTP
    (5) A – public, B - router, C - DHCP

73.

2011 A/L

1.

(a) You have been asked to design two physically separated networks, namely A and B, each having exactly 10 computers. The IP addresses of A and B networks are **10.32.5.0** and **10.32.6.0** respectively. It is required that the computers in the two networks must be able to communicate with each other.

(i) Suggest a suitable subnet mask for each of these networks.

(ii) Name the device required to connect these two physical networks to communicate with each other.

(iii) Draw a network diagram for the above network and assign suitable IP addresses for the devices in these two networks.

(b) (i) Compare TCP and UDP protocols in terms of reliability.

(ii) Peer-to-peer (P2P) and client-server models are distributed application architectures. State the difference between them.

(iii) List the differences between hubs and switches in a network.

2012 A/L

(b) The following shows a part of the result obtained by executing the "ping" command to check the network connectivity to a host connected to a computer network.

```
PING www.cam.ac.uk (131.111.8.46) 56(84) bytes of data.
64 bytes from ipv4.www.cam.ac.uk (131.111.8.46) : icmp_seq=1 ttl=242 time=201 ms
64 bytes from ipv4.www.cam.ac.uk (131.111.8.46) : icmp_seq=2 ttl=242 time=204 ms
64 bytes from ipv4.www.cam.ac.uk (131.111.8.46) : icmp_seq=3 ttl=242 time=196 ms
64 bytes from ipv4.www.cam.ac.uk (131.111.8.46) : icmp_seq=4 ttl=242 time=203 ms
64 bytes from ipv4.www.cam.ac.uk (131.111.8.46) : icmp_seq=5 ttl=242 time=195 ms
--- www.cam.ac.uk ping statistics ---
5 packets transmitted, 5 received,
```

Using the above information, answer the parts (i), (ii), (iii) and (iv) given below.

(i) What is meant by **time** in the above result?

(ii) What is the IP address of the server that hosts the website **www.cam.ac.uk**?

(iii) Identify the class of the IP address obtained in (ii) above.

(iv) What is the percentage of packet loss?

(b) Assume that **A** and **B** are computers connected to **two** network segments. When the command 'ipconfig' is executed in these computers, the following information is obtained:

1. In computer **A**

   IPv4 address .....: 192.168.1.2

   Subnet mask .....: 255.255.255.0

   Default gateway.....: 192.168.1.254

2. In computer **B**

   IPv4 address .....: 192.168.2.3

   Subnet mask .....: 255.255.255.0

   Default gateway.....: 192.168.2.254

Draw a network diagram for the above two network segments so that both **A** and **B** can communicate with each other. You should clearly indicate the IP addresses of each device in the diagram.

(c) Briefly explain the main function of each of the following systems in terms of network security.

(i) firewall

(ii) proxy server

(iii) honey pots

2013 A/L

1.

2. (a) Compare and contrast the following communication technologies:

(i) ISDN vs ADSL

(ii) CDMA vs GSM

(b) Give the main function of the following servers:

(i) Web server

(ii) Mail server

(iii) Proxy server

(iv) DHCP server

(c) An organization has installed a web server, a mail server, a proxy server and a DHCP server to provide Internet based services to its employees. There are ten (10) computers in the organization connected to a local area network. IP addresses are dynamically allocated to these ten computers.

Assume that adequate network cables and two network switches are provided to connect computers to the network. Each switch is capable of connecting a maximum of sixteen (16) computers to the network.

(i) Draw a network diagram to show how these ten computers are connected to the local area network.

(ii) Draw a **separate** network diagram to show how the web server and e-mail server are connected to the Internet.

(iii) Draw **another** network diagram to show how the two networks designed in c (i) and c (ii) above can be connected using a proxy server in order to provide Internet connectivity to computers connected to the local network.

2014 A/L

1.

2. (a) Draw a diagram depicting the seven layers of the OSI reference model.

   (b) You have received an email supposedly from the administrator of your email system notifying that your email account is about to be closed soon. It requests you to click on a link in the email and enter your current user name and the password if you want to continue using your email account. What is the main threat to the security if you agree with this request?

   (c) Draw diagrams to depict the following LAN topologies.
   (i) Bus
   (ii) Star
   (iii) Ring

   (d) A new tool MRTT was used to measure the round trip time for data packets on the Internet between two machines. One machine is at the location X and the other one is at Y The MRTT reported a round trip time between X and Y as 8 ms. The straight-line-distance between point X and point Y is 3 000 km and the maximum speed of light is 300 000 km/s. Based on the above information, can this tool MRTT be relied upon? Justify your answer.

2015 A/L

2. (a) The IP address 125.214.169.218 is assigned to the server www.doenets.lk. The **ping 125.214.169.218** command issued from the machine A reported a round trip time (RTT) of 20 ms.

   However, the **ping www.doenets.lk** command, issued some time later from the machine A, reported an error.

   (i) Draw a network diagram to depict the server, machine A and any other required components to describe the above scenario.

   (ii) Identify **two** possible causes for the above behaviour and explain them using the diagram developed in section (a) (i) above.

   (b) An organization has only one public IP address, 192.248.17.1, allocated to it. The organization has decided to allow web browsing on the computers on its LAN with 100 computers. It also wants to optimize the usage of its Internet connection by reducing the traffic on the link as much as possible.

   Draw a network diagram to satisfy the above requirements. Explain the major decisions you made.

2016 A/L

2. There are two Local Area Networks (LANs) L1 and L2 which are connected only by a router R. These LANs are not connected to any other networks. Machines P and Q are connected to LANs L1 and L2 respectively. The machine P has successfully delivered an IP packet IP1 to machine Q.

In a LAN, an IP packet is sent from the source device to the destination device by inserting it into a frame, generated in the data link layer at the source device. In that LAN, source and destination devices are uniquely identified by the MAC addresses in that frame.

An IP address is recognized by the network layer but it is not recognized by the data link layer.

(a) Draw a network diagram to depict the network described above using commonly used symbols and notations.

(b) State whether the destination IP address of the packet IP1 is the IP address of Q or R when it is going through LAN L1. Justify your answer.

(c) Assume that the IP packet IP1 was in a frame F2 in LAN L2. State whether the source MAC address of frame F2 is the MAC address of P or R. Justify your answer.

2017 A/L

2. A "Demilitarized Zone (DMZ)" is a subnet that contains and exposes an organization's external-facing services such as web servers (public IP addresses) to the Internet while hiding away the rest of the network behind a firewall (using local IP addresses).

A network with a DMZ belonging to an organization has been assigned the public IP address range 123.45.67.0 with subnet mask 255.255.255.224. The DMZ contains the web server and the mail server. It has 4 additional subnets for internal use having the private IP address range 10.0.0.0 with the subnet mask 255.0.0.0. Computers in each subnet can access resources in all other subnets. The organization decided to connect the 4 subnets to the Internet through a proxy server. There is also an application server for its internal clients.

Identify the devices required to establish this network and draw a network diagram to show the logical arrangement of the organization's computer network. Show all the elements of the network with appropriate IP addresses. Clearly show all calculations stating assumptions you made.

Further, it is also required to explain the changes done to an IP packet released by a computer to a subnet by the proxy server when it travels to the Internet.

2. Consider the following scenario.

The XYZ company has six departments, namely *Production*, *Accounts*, *Sales*, *Administration*, *Maintenance* and *Information Technology Services* (*IT*). The following table shows the number of computers available in each of the departments.

Department No.	*Department*	*Number of Computers*
D01	Production	25
D02	Accounts	30
D03	Sales	18
D04	Administration	30
D05	Maintenance	25
D06	IT Services	28

Each department needs to have their own local area network. Network administrator has received a class C IP address block 192.248.154.0/24. It is required to subnet the IP address block to satisfy the requirements of each department and allocate IP addresses to them.

(a) (i) How many addresses are available in the IP address block?

(ii) What are the first and the last addresses of the IP address block?

(iii) How many host bits are required to create the required subnets?

(iv) After subnetting, write the relevant network address, subnet mask and allocated range of IP addresses for each department.

Note: Use the following table format to present your answer.

Department No	*Network Address*	*Subnet Mask*	*IP Address Range*
D01			
D02			
D03			
D04			
D05			
D06			

(b) The XYZ Company links the five departments Production, Accounts, Sales, Administration and Maintenance to the IT Services department and connects those departments to the Internet through the IT Services department. The network has been completed by laying the cables and installing six switches, a router and a firewall. All six departments are situated in six separate buildings.

The administrator allows all subnets to access the Internet through a proxy server. The proxy server and the DNS server are located in the IT Services department.

Draw the labelled network diagram to show the logical arrangement of the computer network of the XYZ company by identifying suitable devices and required cables for all the locations.

(c) After setting up the network any employee of any department was able to access the URL http://www.nie.lk through a web browser in a computer in his/her department. However, one day an employee finds that he cannot access that website from a computer in his department. Write **three** possible reasons for the above problem.

2019 A/L

(b) Write down the most appropriate term from the given list to fill the blank in each statement given below.

List = {*ALOHA, Application Layer, CIDR, DHCP, Domain Name System, Network Layer, Packet Switching, Parity Bit, Parity Byte, Proxy Server*}

(i) ..... provides IP addresses for the given URLs and web addresses.

(ii) File Transfer Protocol (FTP), Simple Mail Transfer Protocol (SMTP) and the Telnet service are implemented in the ..... .

(iii) With the ..... a device may get a different IP address every time it connects to the network.

(iv) ..... helps to effectively manage the available IP address space.

(v) In data transmission, for the process of error detection, a ..... is added to a binary string to ensure that the total number of 1-bits in the string is either even or odd.

2. Consider the following scenario:

A school has acquired the following resources to its *Administrative* (*Admin*), *Laboratory* (*Lab*) and *Library* (*Lib*) buildings:

Building	Resources
Admin	5 computers, 1 printer
Lab	40 computers, 1 printer
Lib	10 computers, 1 printer

A school computer network has to be created to fulfil the following requirements:

- Each building needs to have its own local area network (LAN) in order to share the printer.
- The above three networks are also to be interconnected so that the School Information System (SIS) which is running on one computer in the *Admin* building and the Library Information System (LIS) running on one computer in the *Lib* building are accessible from all computers.
- All computers are to be given efficient Internet connectivity as well. For this purpose, the school has subscribed to an Internet Service Provider (ISP) who is to supply the Internet connectivity to the *Lab* building. The *Lab* building is separated from the other two buildings by approximately 500m. One computer in the *Lab* building is to be used as the DNS server. Another computer in the *Lab* building is to be used as the proxy server.
- The entire network is to be protected through a firewall.

(a) The Principal has received the 192.248.16.0/24 IP address block for the school. The IP addresses for the computers are to be allocated after making three subnets from this address block for the three buildings.
Assuming such subnetting is done, write down the relevant network address, subnet mask and the allocated range of IP addresses for each building using the following table format to present your answer:

Building	Network Address	Subnet Mask	IP Address Range
Admin			
Lab			
Lib			

(b) Give **one** reason as to why a fully connected (all-to-all) network topology is not suitable for this school computer network.

(c) The Lab administrator who is responsible to setup the school computer network has requested for *switches* and a *router*.

Showing clearly the network connection topology and the devices, draw the network diagram to represent the logical arrangement for the school computer network that the Lab administrator can implement to fulfil the school requirements.

(d) Give **one** reason as to why TCP is preferred over UDP as the transport protocol for the school computer network.

2020 A/L

(b) Match each of the given sentences (i) – (v) relating to computer networks with the most suitable item from the list below.

List = {*ADSL Connection, DSL Connection, FTP, HTTP, Internet Layer, Malware, Phishing, TCP, Transport Layer, UDP*}

(i) A simple and query based communication model with a minimum use of protocol mechanisms applied in transport layer

(ii) A protocol for data communication in the World Wide Web

(iii) The layer that defines the addressing and routing structures used for the TCP/IP protocol suite in the TCP/IP model

(iv) The process of attempting to get sensitive information from someone by pretending as a trustworthy person

(v) The connection that allows the data transmission at much greater speed and capacity than the narrowband services

Note: Write only the matching item against the phrase number.

(i) .....

(ii) .....

(iii) .....

(iv) .....

(v) .....

6. Consider the following scenario:

The PQR Company has three departments, namely *Finance*, *Marketing* and *Human Resource* (HR). At present all the activities of the PQR Company are conducted manually. The company decides to computerize all their activities by establishing an IT unit with a computer lab for staff training. Resources will be allocated for each department and the IT unit as follows.

Department	Resources		
	Computers	Printer type	Software Server
Finance	28	01 Network Printer	Accounting Information System (AIS)
HR	40	01 Network Printer	Human Resource Information System (HRIS)
IT Unit	50	01 Printer	Learning Management System (LMS)
Marketing	35	01 Network Printer	Marketing Information System (MKIS)

The company proposes the following:

- A Local Area Network (LAN) for each Department and the IT unit in order to share specific software and resources
- LANs in each department to be interconnected via IT unit
- All computers to be given efficient Internet connectivity with the help of a DNS (Domain Name System) and proxy servers
- An Internet Service Provider (ISP) to supply the Internet connectivity to the IT unit
- The entire network to be protected through a firewall

(a) Which network topology is the most suitable to satisfy all the above mentioned requirements? Give **one** reason to justify your answer.

(b) The Network Administrator has received 192.168.14.0/24 as the IP address block for the company. The IP addresses for the nodes are to be allocated after making four subnets from this address block for each department/unit.

The following incomplete table shows the sub-netting. Write down the missing IP addresses for each department/unit using the following table format. (Assume that subnetting is done under the consideration of future expansion of each department/unit.)

Department	Network ID	Broadcast ID	Subnet Mask	Usable IP Address Range
Finance	192.168.14.0	192.168.14.63	255.255.255.192	192.168.14.1–192.168.14.62
HR				
IT Unit				
Marketing				

(c) Showing clearly the connection topology and the devices, draw the logical arrangement for the company network that the network administrator can implement to fulfill the company's requirements. (Assume that additional IP addresses can be obtained.)

(d) Network administrator decides to dynamically manage the IP addresses of the entire network. Write down the mechanism that needs to be implemented to achieve this task.

6. (a) *Parity Check* is a simple technique to detect errors in data communications.

Assume the seven bits 1010110 need to be transmitted. Explain how the odd parity check can be performed to detect any error in its transmission. **[02 *marks*]**

(b) The **ABC company** has two main divisions, namely **Production** and **Marketing**. Under the **Production** division, there are three units, namely **Stores**, **Supplies** and **Operations** having 10, 12 and 18 computers, respectively. **Marketing** division has 40 computers. ABC company has been given the 192.174.19.0/25 IP address block. All the computers of the ABC company are to be assigned IP addresses after making the subnets from this address block.

The following incomplete table shows the sub-netting. Copy it to your answer sheet and fill the empty entries.

Division/ Unit	Network ID	Broadcast ID	Subnet Mask	No. of Nodes	Usable IP Address Range
Marketing	192.174.19.0			64	
Stores		192.174.19.79		16	
Supplies	192.174.19.96			16	
Operations		192.174.19.159		32	

[06 *marks*]

(c) Mohan has ten (10) desktop computers and a router having 2 ports with a 64 Mbps Internet connection. Each computer has an adequate number of network interface cards. He also has a sufficient number of RJ 45 connected twisted pair cables.

Mohan wants to start an Internet Browsing Center with the above equipment and seeks your advice for it. He informs you that he is not in a position to invest money for any new equipment.

(i) Which network topology will you suggest for Mohan? **[01 *mark*]**

(ii) Draw the logical arrangement of the network that you propose. **[02 *marks*]**

(iii) Mohan would like to improve the connection speed to the clients while saving the existing bandwidth of the Internet connection. Further he needs to have the control of the Internet access while ensuring the privacy of the client. What is the technical suggestion you would give for this? **[01 *mark*]**

(iv) There is a need to protect this private network by filtering the communication traffic and blocking outsiders from gaining unauthorized access. What mechanism will you suggest to achieve this? **[01 *mark*]**

(v) Include the solutions that you proposed for (iii) and (iv) above in the logical network arrangement that you drew for (ii). **[02 *marks*]**