



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF COMPUTING AND INFORMATICS  
DEPARTMENT OF COMPUTER SCIENCE**

<b>QUALIFICATION: BACHELOR OF COMPUTER SCIENCE, BACHELOR OF INFORMATICS</b>	
<b>QUALIFICATION CODE: 07BACS, 07BAIF</b>	<b>LEVEL: 7</b>
<b>COURSE NAME: DATA NETWORK</b>	<b>COURSE CODE: DTN611S</b>
<b>DATE: JUNE 2025</b>	<b>PAPER: THEORY</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 80</b>

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
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THIS QUESTION PAPER CONSISTS OF 8 PAGES (Including this front page)

#### **INSTRUCTIONS**

- 1) Answer ALL the questions on the answer scripts provided.
- 2) Write clearly and neatly.
- 3) Be guided by the number of marks allocated when answering the questions.
- 4) Show all your calculations.
- 5) Number your questions clearly.

#### **Permissible Material**

1. Calculators.

**Question 1: Multiple Choice, fill in and True/False questions**

[20]

**1 mark**

1. A user is having problems accessing the Internet. The command "ping www.cisco.com" is executed but fails. However, pinging the IP address of cisco with the command "ping 198.133.219.25" is successful. What is the problem?
  - a) The web server is down
  - b) The default gateway is incorrect
  - c) DNS server is not resolving.
  - d) The ARP cache needs to be cleared
  
2. Which protocol will return the following message "Destination Unreachable"
  - a. UDP
  - b. IP
  - c. ICMP
  - d. TCP
  
3. A company is expanding its business to other countries. All branch offices must always remain connected to corporate headquarters. Which network type is required to support this requirement?
  - a) Wide Area Network
  - b) Internet
  - c) Local Area Network
  - d) Metropolitan Area Network
  
4. During the encapsulation process, what occurs at the data link layer for a PC connected to an Ethernet network?
  - a) An IP address is added
  - b) The logical address is added
  - c) The physical address is added
  - d) The process port number is added
  
5. Which physical medium uses the propagation of light to transmit data?
  - a) Twisted Pair Cable
  - b) Coaxial Cable
  - c) Fibre-Optic Cable
  - d) Microwave

6. Which of the following layer's primary functions is to transmit/move data from one node to another adjacent node over a single communication link?
  - a) Network Layer
  - b) Session Layer
  - c) Physical Layer
  - d) Data Link Layer
  
7. What is the process of removing header information on packets added at lower layers on the network protocol stack when data moves upward.
  - a) Encapsulation
  - b) Encoding
  - c) Decapsulation
  - d) Decoding
  
8. A network where every device is directly connected to every other device is called:
  - a) Mesh
  - a) Hybrid
  - b) Star
  - c) Bus
  
9. What is latency in computer networking?
  - a) The amount of data that can be transmitted per unit time
  - b) The number of errors encountered during data transmission
  - c) The time it takes for data to travel from source to destination
  - d) The capacity of the network to handle simultaneous connections
  
10. What network mechanism is employed by TCP to manage the transmission of data over a communication channel, preventing packet loss due to excessive data transmission?
  - a) Congestion Control
  - b) Timers
  - c) Flow Control
  - d) Sliding Window
  
11. Which command can be executed to display the available network interfaces on a computer?
  - a) Netstat
  - b) Arp -a
  - c) Ifconfig
  - d) Nslookup
  
12. Which network techniques enable devices on a **private network** to access the **internet by using a single public IP address**.
  - a) Address Translation Protocol (ATP)
  - b) Domain Name System (DNS)

- c) Port Address Translation (PAT)
- d) Network Address Translation (NAT)

13. The Three-way handshake messages **establish** and **terminate** a connection in which sequence.

- a) SYN, ACK, SYN-ACK, ACK-FIN
- b) SYN, SYN-ACK, ACK, FIN-ACK
- c) SYN, SYN-ACK, ACK, FIN-FIN
- d) SYN, SYN-ACK, FIN, ACK-FIN

14. Which is the correct default subnet mask for Class B network address:

- a) /18
- b) /9
- c) /16
- d) /8

15. Which network communication is useful for remote and long-distance communications where traditional infrastructure (like fiber optics or cellular towers) is difficult to deploy.

- a) Bluetooth
- b) Infrared
- c) Satellite communication
- d) LTE

#### **True/False**

16. Sockets are physical endpoints used for communication between hosts over a network.

- a) True
- b) False

17. A switch forwards bits as the unit of data in computer networks.

- a) True
- b) False

18. The Post method is used to upload a file on webservers.

- a) True
- b) False

19. When accessing a web server, the status code 500 indicates that the server is not available.

- c) True
- d) False

20. The 3-way handshake guarantees encryption of the data.

- a) True
- b) False

**Question 2****[21 marks]**

James was recently hired as a PC Technician by Young Tech CC. The company has purchased 10 new desktop computers for use in their internet café. Young Tech CC also hosts its own website and email services, The IT Manager has instructed James to configure the computers using a Bus Network Topology and apply the necessary network settings to enable internet access.

Since:

- a) Explain why the manager would recommend Bus Topology for their internet café. (3)
- b) What are some potential problems James may face when using a Bus Topology? (3)
- c) Name 4 Network configuration settings that are necessary for internet access? (4)
- d) Which IP address classes is most suitable for a small internet café with 10 users? (1)
- e) What type of cable is commonly used in a traditional Bus Topology for backbone network? (1)
- f) To configure the devices with necessary network settings, which method would be appropriate for this network at that point in time, explain your answer? (2)
- g) State two servers which James is required to set up and state the function of each server. (2)
- h) Given the disadvantages of the bus topology, what would be the most suitable topology? Justify your answer. (5)

**Question 3:****[14]**

Refer to the diagram below when answering the questions.

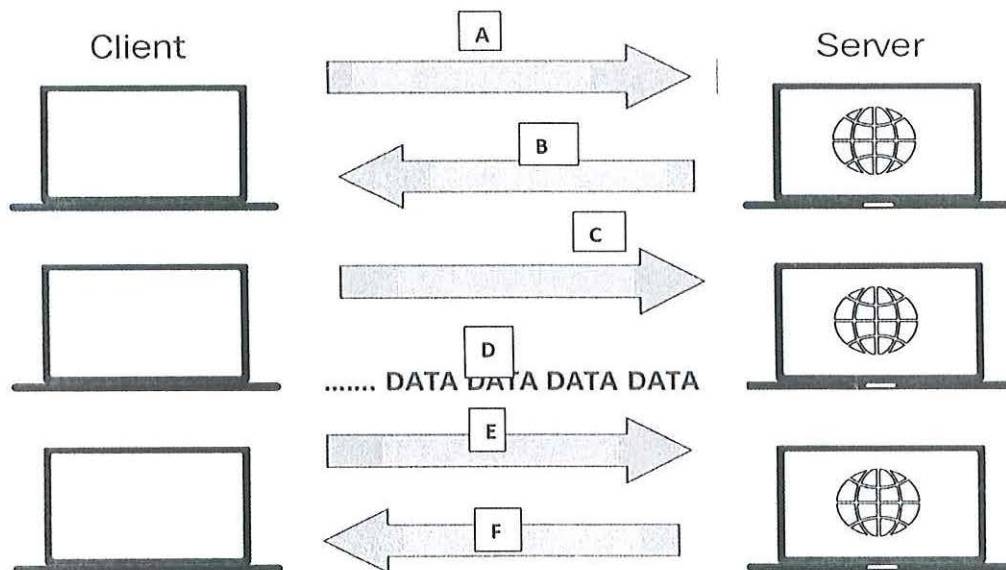


Figure 3.1: 3-way handshake

- Explain the process of the three-way handshake and connection **termination** process between the client and server. Use labels to describe what happens at each step, indicate the packets sent at each step. (6)
- During step D, the server did not receive one of the data packets, how will the client know that the server did not receive the packet what will the client do about this situation. (2)
- Briefly explain the purpose of any three fields in the segment header. (3)
- How does the window size help ensure reliable data transmission? (3)

#### Question 4

[10]

Refer to the diagram below when answering the questions.

```

Tracing route to yahoo.com [98.138.219.232]
over a maximum of 30 hops:
 0 Arush [192.168.0.101]
 1 dlink.router [192.168.0.1]
 2 abts-mh-dynamic-001.34.169.122.airtelbroadband.in [122.169.34.1]
 3 125.18.73.17
 4 182.79.245.69
 5 pat1.pao.yahoo.com [198.32.176.135]
 6 ae-7.pat2.dnx.yahoo.com [216.115.96.115]
 7 ae-6.pat1.nez.yahoo.com [216.115.104.118]
 8 et-0-0-0.msrl.ne1.yahoo.com [216.115.105.25]
 9 et-0-0-0.clr1-a-gdc.ne1.yahoo.com [98.138.97.61]
10 po254.has1-1-flk.ne1.yahoo.com [98.138.0.85]
11 yahoo.com [98.138.219.232]

Computing statistics for 275 seconds...
Hop  RTT      Source to Here   This Node/Link
      Lost/Sent = Pct  Lost/Sent = Pct  Address
 0
 1   4ms      0/ 100 = 0%      0/ 100 = 0%      dlink.router [192.168.0.1]
 2   6ms      0/ 100 = 0%      0/ 100 = 0%      abts-mh-dynamic-001.34.169.122.airtelbroadband.in [122.169.34.1]
 3   8ms      0/ 100 = 0%      0/ 100 = 0%      125.18.73.17
 4  256ms    0/ 100 = 0%      0/ 100 = 0%      182.79.245.69
 5  265ms    0/ 100 = 0%      0/ 100 = 0%      pat1.pao.yahoo.com [198.32.176.135]
 6  285ms    0/ 100 = 0%      0/ 100 = 0%      ae-7.pat2.dnx.yahoo.com [216.115.96.115]
 7  279ms    0/ 100 = 0%      0/ 100 = 0%      ae-6.pat1.nez.yahoo.com [216.115.104.118]
 8  290ms    0/ 100 = 0%      0/ 100 = 0%      et-0-0-0.msrl.ne1.yahoo.com [216.115.105.25]
 9  ---      100/ 100 =100%   100/ 100 =100%   et-0-0-0.clr1-a-gdc.ne1.yahoo.com [98.138.97.61]
10  ---      100/ 100 =100%   100/ 100 =100%   po254.has1-1-flk.ne1.yahoo.com [98.138.0.85]
11  275ms    0/ 100 = 0%      0/ 100 = 0%      yahoo.com [98.138.219.232]

Trace complete.

```

Figure 4.1: Screenshot

- a) What is the command executed to output the results above in figure 4.1? (2)
- b) Explain the function of the command you indicated in (a). (2)
- c) What is the default gateway of the computer that was used to perform this command? (2)
- d) What is the destination IP address? (2)
- e) What could be the possible cause of long response time taken at hop 8. (2)
- f) What is the purpose of the Round-Trip Time in networking (2)

Question 4

[15]

A host in your network is assigned the IP address 10.10.10.100 with subnet mask 255.255.255.0.  
Provide the following information. (*N.B. show your calculations*)

- a) Indicate the dotted Subnet Address. (3)
- b) Indicate the number of subnet bits and host bits. (2)
- c) Indicate the number of hosts per subnet. (2)
- d) Calculate the Network Number. (3)
- e) Calculate the broadcast address. (3)
- f) Calculate the network number of the next subnet. (2)

***Exam ends***