Grade 12 A/L ICT · Lesson 6

6.7 IPv4 Addressing, Subnetting and Routing

Syllabus 6.7. Gateways join networks. **IPv4** gives global addresses; you calculate **subnets**, **masks** and **CIDR**, meet **private IPs** and **DHCP**, glimpse **IPv6**, and see **routing** with **packet switching** and best-effort delivery.

1. From LAN to Internet

A **gateway** connects networks. **IP addresses** are uniform and independent of MAC/LAN tech.

2. Subnetting worked example

Start with **192.168.10.0/24**. Borrow **2** bits → **/26**, mask **255.255.255.192**, **4** subnets, **62** hosts each.

192.168.10.0/24 → four /26 subnets

/26 block 0	/26 block 1	/26 block 2	/26 block 3
192.168.10.0	192.168.10.64	192.168.10.128	192.168.10.192
…192.168.10.62	…192.168.10.126	…192.168.10.190	…192.168.10.254
bcast 63	bcast 127	bcast 191	bcast 255
62 hosts	62 hosts	62 hosts	62 hosts

Four /26 subnets

🧱 **Worked example: Hosts in /26?**
2^(32-26)−2 = **62**.

🧱 **Worked example: Hosts in /20?**
2^12−2 = **4094**.

3. DHCP, private IPs, routing

Private ranges (e.g. 192.168.0.0/16) are not routed on the public Internet. **DHCP** assigns IPs dynamically. **Routers** choose paths; **packet switching** forwards packets hop by hop (**best effort**). **IPv6** eases IPv4 scarcity.

🚀 **Beyond the syllabus (2026 update)** *Not required for the exam – read for interest.* CGNAT and IPv6 deployment continue; exam still drills /24→/26 style sums.

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Key Words

IPv4 – 32-bit Internet address.	**Subnet mask** – Marks network vs host bits.
CIDR – Prefix length notation like /26.	**Gateway** – Device linking networks.
DHCP – Dynamic Host Configuration Protocol.	**Private IP** – Non-routable on public Internet.
Router – Forwards packets between networks.	**Packet switching** – Data sent as packets hop by hop.
Best effort – IP tries but does not guarantee delivery.	**IPv6** – Larger address space successor.
Host bits – Bits identifying hosts in a subnet.	**Broadcast address** – All-hosts address in a subnet.

Sample Q&A

1. Role of a gateway?

> **Answer:** Connects two or more networks.

2. Mask for /26?

> **Answer:** 255.255.255.192

3. Hosts per /26?

> **Answer:** 62.

4. 192.168.10.0/24 with 2 borrowed bits → ?

> **Answer:** /26 and 4 subnets.

5. DHCP does what?

> **Answer:** Assigns IP settings dynamically.

6. Packet switching means?

> **Answer:** Forward packets hop by hop.

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MCQ

1. /26 mask is

A. 255.255.255.0
B. 255.255.255.255
C. 255.0.0.0
D. 255.255.255.192
E. 255.255.0.0

2. /26 usable hosts

A. 62
B. 64
C. 2
D. 30
E. 32

3. Borrow 2 bits from /24 yields

A. 1
B. 4 subnets
C. 2
D. 8
E. 16

4. First subnet network

A. 192.168.10.64
B. 192.168.11.0
C. 192.168.10.0
D. 10.0.0.0
E. 192.168.10.128

5. DHCP assigns

A. IP addresses dynamically
B. only GUI themes
C. only MAC forever
D. only fiber colours
E. only parity bits

6. Routers mainly

A. boil water
B. draw icons
C. print essays
D. find paths / forward packets
E. cut fiber

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7. Private IPs are

A. always multicast only
B. always IPv6
C. always banned locally
D. always public
E. not routed on the public Internet

8. Hosts in /20

A. 254
B. 4096
C. 4094
D. 1022
E. 62

9. Which term means: “32-bit Internet address”?

A. Private IP
B. IPv4
C. Packet switching
D. CIDR
E. Host bits

10. Which term means: “Marks network vs host bits”?

A. Gateway
B. Broadcast address
C. Subnet mask
D. Router
E. Best effort

11. Which term means: “Prefix length notation like /26”?

A. Packet switching
B. DHCP
C. IPv6
D. CIDR
E. IPv4

12. Which term means: “Device linking networks”?

A. Host bits
B. Private IP
C. Best effort
D. Subnet mask
E. Gateway

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13. Which term means: “Dynamic Host Configuration Protocol”?

A. Broadcast address
B. DHCP
C. Router
D. IPv6
E. CIDR

14. Which term means: “Non-routable on public Internet”?

A. Gateway
B. Packet switching
C. Host bits
D. IPv4
E. Private IP

15. Which term means: “Forwards packets between networks”?

A. Broadcast address
B. Router
C. Subnet mask
D. DHCP
E. Best effort

16. Which term means: “Data sent as packets hop by hop”?

A. Packet switching
B. Private IP
C. IPv4
D. IPv6
E. CIDR

17. Which term means: “IP tries but does not guarantee delivery”?

A. Router
B. Subnet mask
C. Gateway
D. Best effort
E. Host bits

18. Which term means: “Larger address space successor”?

A. IPv6
B. DHCP
C. Broadcast address
D. Packet switching
E. CIDR

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19. Which term means: “Bits identifying hosts in a subnet”?

A. Private IP
B. Best effort
C. Host bits
D. IPv4
E. Gateway

20. Which term means: “All-hosts address in a subnet”?

A. IPv6
B. Router
C. DHCP
D. Subnet mask
E. Broadcast address

Structured Questions

1. Explain gateway and need for IP. *(2 marks)*

> Joins LANs; uniform addressing beyond MAC.

2. Given 192.168.10.0/24 borrow 2 bits: mask, subnet count, hosts. *(3 marks)*

> 255.255.255.192; 4; 62.

3. List first subnet net, usable range, broadcast. *(3 marks)*

> 192.168.10.0; 192.168.10.1–192.168.10.62; 192.168.10.63

4. DHCP and private IP roles. *(2 marks)*

> Dynamic config; non-public ranges.

5. Routing, packet switching, best effort. *(3 marks)*

> Path selection; hop forwarding; no hard guarantee.

Summary

- Gateways interconnect networks.
- IPv4 + masks + CIDR.
- Worked /24→/26 example.
- DHCP and private addresses.
- Routers forward packets best-effort.

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MCQ answer key – 6.7

1. **D** – 192 = 2 borrowed bits.
2. **A** – 2^6−2=62.
3. **B** – 2^2=4.
4. **C** – Base block.
5. **A** – Dynamic IP.
6. **D** – Routing.
7. **E** – Not public-routed.
8. **C** – 2^12−2.
9. **B** – IPv4 – 32-bit Internet address.
10. **C** – Subnet mask – Marks network vs host bits.
11. **D** – CIDR – Prefix length notation like /26.
12. **E** – Gateway – Device linking networks.
13. **B** – DHCP – Dynamic Host Configuration Protocol.
14. **E** – Private IP – Non-routable on public Internet.
15. **B** – Router – Forwards packets between networks.
16. **A** – Packet switching – Data sent as packets hop by hop.
17. **D** – Best effort – IP tries but does not guarantee delivery.
18. **A** – IPv6 – Larger address space successor.
19. **C** – Host bits – Bits identifying hosts in a subnet.
20. **E** – Broadcast address – All-hosts address in a subnet.

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