Grade 12 A/L ICT · Lesson 6

Lesson 6 A/L Exam Practice: Questions and Answers

This practice paper assesses **Lesson 6: Data Communication and Networking** (syllabus competency 6). Paper I has 30 five-option MCQs. Paper II Part A has four structured questions; Part B has three essays. Marking points are shown in brackets.

Paper I – Multiple choice questions (30)

1. A digital signal mainly uses

A. random heat
B. discrete levels such as two voltages
C. paper letters
D. only smooth sine waves
E. folder icons

2. Wavelength λ equals

A. 1 / v
B. v + f
C. v / f
D. f / v
E. v × f

3. For f=100 MHz and v=3×10^8 m/s, λ is

A. 3 km
B. 300 m
C. 30 m
D. 3 m
E. 0.3 m

4. Guided media include

A. only free space
B. twisted pair, coaxial and fiber
C. paper mail
D. only vacuum
E. USB icons

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5. Propagation delay for 1500 km at 2×10^8 m/s is

A. 7.5 s
B. 1 hour
C. 0 ms
D. 75 ms
E. 7.5 ms

6. Tx time for 5 MB on 10 Mbps is about

A. 7.5 ms
B. 4.19 s
C. 0 s
D. 10 hours
E. 1 year

7. Manchester encoding places a transition

A. never
B. only in IP headers
C. only in DNS
D. in the middle of each bit
E. only at dawn

8. Even parity bit for 1011001 is

A. 1
B. 2
C. undefined
D. 11
E. 0

9. A modem

A. only cuts fiber
B. modulates and demodulates
C. only assigns MAC
D. only paints cables
E. only boils water

10. PSTN classically carries

A. only fiber colours
B. only GUI themes
C. only MAC frames
D. analog voice
E. only USB power

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11. A bus topology uses

A. only paper
B. only USB sticks
C. one shared medium
D. only DNS
E. only satellites

12. A switch typically

A. paints fiber
B. ignores all frames
C. blocks electricity
D. eats packets
E. forwards using addresses

13. MAC addresses identify

A. only folders
B. only CPU brands
C. only printers ink
D. network interfaces on a LAN
E. only passwords

14. ALOHA is

A. a simple early MAC protocol
B. an IP version
C. a fruit only
D. a fiber colour
E. a topology only

15. /26 mask is

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

16. /26 usable hosts

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

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17. Borrow 2 bits from /24 yields

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

18. Hosts in /20

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

19. UDP is

A. connectionless datagram service
B. always a topology
C. a hub flood
D. a MAC type
E. a subnet mask

20. TCP is

A. reliable connection-oriented byte stream
B. always wireless only
C. a hub flood
D. a bus cable
E. a parity bit

21. DNS maps

A. cables to colours
B. names to IP addresses
C. fonts to sizes
D. inks to printers
E. chairs to heights

22. HTTP GET is sent by

A. only the hub
B. only the PSTN
C. only the fiber
D. the client (e.g. browser)
E. only the GPU

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23. TCP/IP has

A. 12
B. 1 only
C. 0
D. 7 only
E. 4 layers

24. OSI has

A. 7 layers
B. 11
C. 4 only
D. 2
E. 9

25. A frame is used at

A. only tea
B. data link
C. only DNS text
D. only HTTP verbs
E. only GUI

26. Encryption mainly provides

A. chair height
B. mouse DPI
C. confidentiality
D. font size
E. cable colour

27. Phishing attacks

A. trick people
B. only hub LEDs
C. only fan noise
D. only fiber photons
E. only copper atoms

28. A firewall

A. irons shirts
B. draws cartoons
C. boils water
D. filters network traffic
E. cuts paper

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29. NAT translates

A. chairs to desks
B. songs to notes
C. private addresses to public
D. tea to coffee
E. fonts to colours

30. An ISP provides

A. only paint
B. only pencils
C. Internet connectivity
D. only chairs
E. only lunch

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Paper II Part A – Structured questions

1. Signals, media and encoding *(8 marks)*

(i) Define analog and digital signals. State λ = v/f and find λ for f=100 MHz, v=3×10^8 m/s. *(3 marks)*
(ii) Classify guided vs unguided media with examples. Explain latency and bandwidth. *(3 marks)*
(iii) Even parity for 1011001? Why Manchester helps synchronization. *(2 marks)*

2. Topologies, MAC and IP subnetting *(8 marks)*

(i) Compare bus and star; hub vs switch (one clear point each). *(3 marks)*
(ii) What are MAC addresses and frames? Unicast vs broadcast. *(2 marks)*
(iii) 192.168.10.0/24 borrow 2 bits: new prefix, mask, subnet count, hosts per subnet. *(3 marks)*

3. Transport, apps and models *(8 marks)*

(i) Why ports? Contrast UDP and TCP with one application each. *(3 marks)*
(ii) DNS role and HTTP GET in client–server terms. *(2 marks)*
(iii) List TCP/IP four layers and OSI layer count; name bit, frame, packet. *(3 marks)*

4. Security and home access *(8 marks)*

(i) Public vs private keys; one use of encryption and of a digital signature. *(2 marks)*
(ii) Name three threats and three protections. *(3 marks)*
(iii) ISP role; ADSL vs dial-up; NAT in a home private LAN. *(3 marks)*

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Paper II Part B – Essay questions

1. From signals to shared media *(10 marks)*

(i) Explain analog vs digital, amplitude, frequency, wavelength and phase with λ=v/f. *(4 marks)*
(ii) Guided/unguided media and how latency, bandwidth, noise, attenuation, distortion affect links. *(3 marks)*
(iii) Encoding: two voltages, Manchester, sync need, parity example 1011001. *(3 marks)*

2. Building and interconnecting LANs *(10 marks)*

(i) Topologies (bus/star/ring/mesh) and hub vs switch. *(4 marks)*
(ii) MAC addresses, frames, ALOHA→Ethernet, broadcast/unicast. *(3 marks)*
(iii) Full subnetting: 192.168.10.0/24 → /26 (mask, counts, first subnet range). *(3 marks)*

3. End-to-end Internet use and safety *(11 marks)*

(i) TCP vs UDP with ports; DNS and HTTP client–server. *(4 marks)*
(ii) Compare TCP/IP and OSI; define bit, frame, packet. *(3 marks)*
(iii) Keys/threats/protections and ISP+NAT home picture. *(4 marks)*

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Exam tips

- Memorise λ = v/f and T = 1/f.
- Tx time = size_bits / bandwidth; prop delay = distance / speed.
- Parity: count 1s, then choose even/odd bit.
- Hub floods; switch filters by address.
- Hosts = 2^(host bits) − 2; subnets = 2^(borrowed).
- /26 mask is 255.255.255.192.
- UDP = simple/unreliable; TCP = reliable stream.
- DNS names→IP; HTTP GET is client→server.
- TCP/IP 4 layers; OSI 7; bit/frame/packet.
- Firewall + antivirus + awareness.
- NAT shares one public IP among private hosts.
- Beyond boxes (QUIC, DoH) are interest only.

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Answers and explanations

Paper I

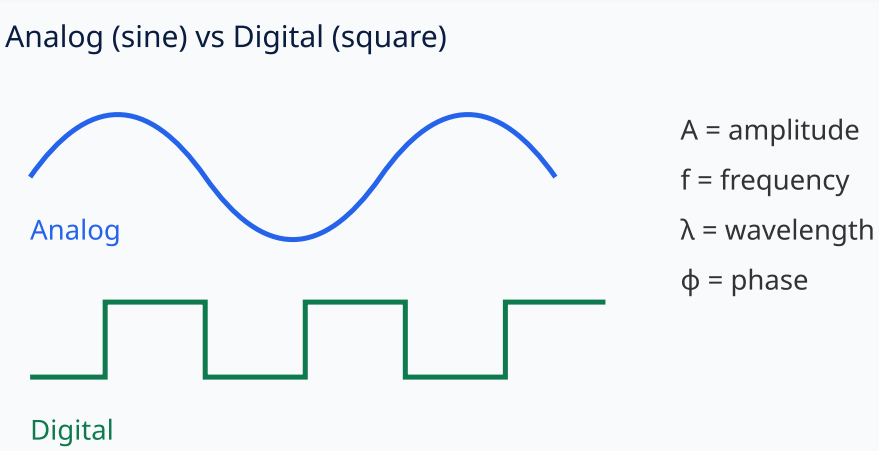
1. **B** – Discrete levels.
2. **C** – λ=v/f.
3. **D** – 3 m.
4. **B** – Cables/fiber.
5. **E** – 7.5 ms.
6. **B** – ≈4.19 s.
7. **D** – Mid-bit.
8. **E** – Four 1s → 0.
9. **B** – Mod/demod.
10. **D** – Analog voice.
11. **C** – Shared medium.
12. **E** – Address-aware.
13. **D** – Interfaces.
14. **A** – Early MAC.
15. **C** – 255.255.255.192.
16. **E** – 2^6−2=62.
17. **A** – 2^2=4.
18. **E** – 2^12−2.
19. **A** – Datagram.
20. **A** – Reliable.
21. **B** – Name→IP.
22. **D** – Client.
23. **E** – Four.
24. **A** – Seven.
25. **B** – Data link.
26. **C** – Privacy.
27. **A** – People.
28. **D** – Filters.
29. **C** – Address translate.
30. **C** – Connectivity.

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Paper II Part A – model answers and marking points

1. *(8 marks)*

(i) (3 marks)
Analog continuous; digital discrete (1); λ=v/f (1); λ=3 m (1).



Signals.

(ii) (3 marks)
Guided TP/coax/fiber; unguided radio/Wi-Fi (2); latency=delay; bandwidth=capacity/s (1).

(iii) (2 marks)
Parity 0 (1); mid-bit transitions recover timing (1).

🎯 Examiner tip: show working for λ and parity.

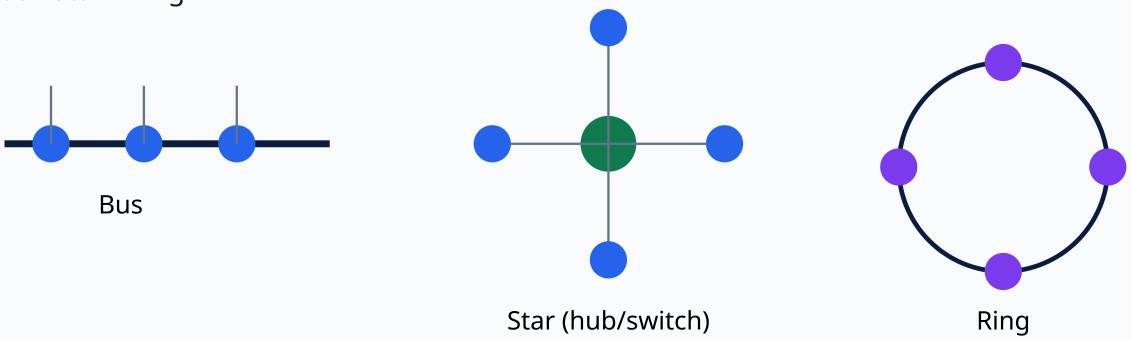
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2. *(8 marks)*

(i) (3 marks)

Bus shared cable; star via centre (1); hub floods all; switch forwards by address (2).

Bus · Star · Ring



Topologies.

(ii) (2 marks)

Interface address; LAN data unit (1); one vs all (1).

(iii) (3 marks)

/26; 255.255.255.192; 4; 62.

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

Subnets.

🎯 Examiner tip: write 2^n−2 for hosts.

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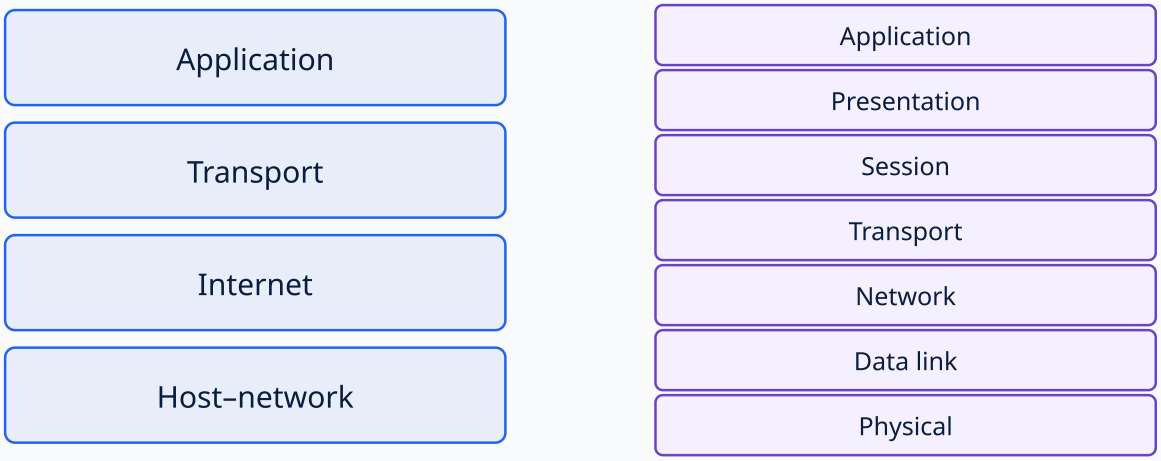
3. *(8 marks)*

(i) (3 marks)
Many apps share one IP (1); UDP datagram/DNS (1); TCP reliable/HTTP (1).

(ii) (2 marks)
Names → IP (1); client requests, server responds (1).

(iii) (3 marks)
App/transport/internet/host-network (2); OSI 7; bit/frame/packet (1).

TCP/IP (left) and OSI (right)



Models.

🎯 Examiner tip: map HTTP to application and IP to internet/network.

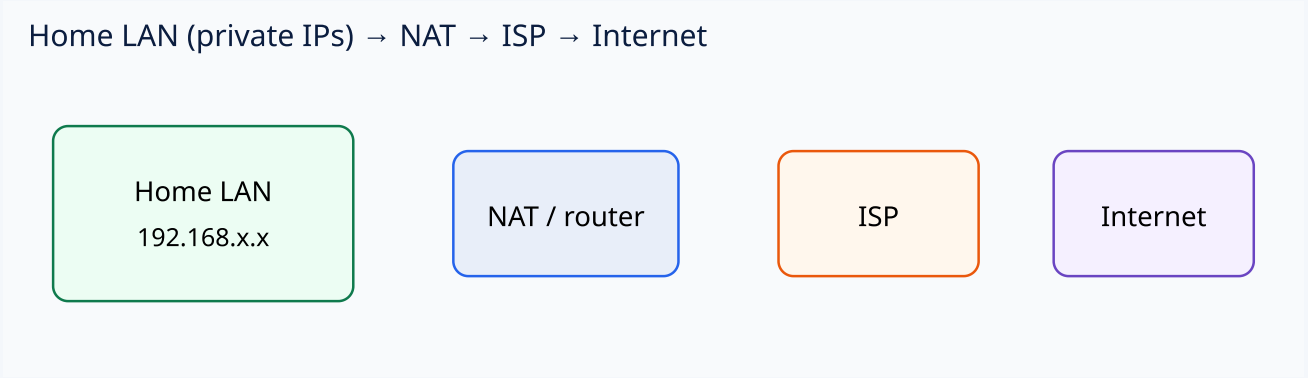
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4. *(8 marks)*

(i) (2 marks)
Public shared / private secret (1); encrypt vs authenticate/sign (1).

(ii) (3 marks)
Virus/Trojan/malware/phishing any three (1.5); firewall/antivirus/awareness (1.5).

(iii) (3 marks)
Connects to Internet (1); faster/always-on (1); private→public share (1).



Home NAT.

🎯 Examiner tip: sketch LAN→NAT→ISP→Internet.

Paper II Part B – model answers and marking points

1. *(10 marks)*

(i) (4 marks)
Definitions (2); properties (1); formula (1).

(ii) (3 marks)
Examples (1); each impairment clear (2).

(iii) (3 marks)
Elements (1); Manchester/sync (1); parity 0 (1).

🎯 Examiner tip: include at least one calculated λ or delay.

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2. *(10 marks)*

> **(i)** (4 marks)
> Four topologies (2); hub flood vs switch filter (2).

> **(ii)** (3 marks)
> Address/frame (1); MAC evolution (1); uni/broad (1).

> **(iii)** (3 marks)
> Mask 255.255.255.192; 4 subnets; 62 hosts; first range (3).

> 🎯 Examiner tip: box final mask and host count.

3. *(11 marks)*

> **(i)** (4 marks)
> Ports (1); TCP/UDP contrast+apps (2); DNS/HTTP (1).

> **(ii)** (3 marks)
> 4 vs 7 layers (2); PDUs (1).

> **(iii)** (4 marks)
> Keys (1); threats (1); protections (1); ISP/NAT (1).

> 🎯 Examiner tip: one Sri Lankan school/home example scores clarity marks.

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