Grade 13 A/L ICT · Lesson 11

Lesson 11 A/L Exam Practice: Questions and Answers

This practice paper assesses **Lesson 11: Internet of Things** (syllabus competency 11). 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. ADC, resistor and threshold answers were recomputed; every Arduino sketch was simulated.

Paper I – Multiple choice questions (30)

1. An Arduino Uno is best described as a

A. router only
B. Microprocessor Development System
C. desktop PC
D. web browser
E. hard disk

2. Compared with a traditional PC, an MDS mainly

A. runs office suites only
B. cannot be programmed
C. talks directly to sensors and actuators
D. has no USB
E. needs a CRT monitor

3. Pins labelled A0–A5 are used for

A. paper printing
B. display output only
C. audio speakers
D. analog input
E. Ethernet only

4. A 10-bit ADC converts 0–5 V into

A. 0–100
B. 0–1023
C. 0–255
D. 0–5
E. 0–65535

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5. raw 820 equals about

A. 1.000 V
B. 2.500 V
C. 5.000 V
D. 0.200 V
E. 4.004 V

6. LED series resistor (5 V, Vf 2 V, 20 mA) is

A. 220 Ω
B. 150 Ω
C. 50 Ω
D. 100 Ω
E. 1 kΩ

7. In the LDR sketch, raw 180 turns the LED

A. off forever
B. into reset
C. into RX
D. HIGH (on)
E. LOW (off)

8. LM35 outputs roughly

A. 10 V per °C
B. 1 V per °C
C. 100 V per °C
D. 1 mV per °C
E. 10 mV per °C

9. Fan hysteresis means

A. Wi-Fi only
B. different ON and OFF temperatures
C. always ON
D. USB only
E. no temperature sensor

10. A reed switch on a door is a

A. cloud server
B. CSS file
C. compiler
D. sensor
E. actuator

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11. The Arduino IDE includes

A. only a paint tool
B. only FTP
C. editor, compiler and programmer
D. only DNS
E. only a calculator

12. Upload to the board normally uses

A. HDMI
B. VGA
C. parallel printer
D. PS/2 keyboard
E. USB

13. IoT stands for

A. Internal Office Tools
B. Index of Tables
C. Input of Transistors
D. Internet of Things
E. Internet of Televisions

14. A need addressed by IoT is

A. remote control of devices
B. removing sensors
C. banning phones
D. hand-copying books
E. avoiding all networks

15. Soil-moisture irrigation is an IoT application in

A. only gaming
B. only cable TV
C. smart farming
D. only CD-ROM
E. only desktop publishing

16. Which is an enabling technology for IoT?

A. CRT only
B. vinyl records
C. punched cards
D. fountain pens
E. Wi-Fi / Internet connectivity

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17. In the remote-switch sketch the actuator is the

A. relay
B. LM35
C. reed switch
D. LDR
E. USB cable

18. The browser command that turns the device on is

A. FTP PUT /off
B. DNS only
C. SMTP MAIL
D. CSS hover
E. HTTP GET /on

19. The board program answering /on and /off is a

A. web server
B. spreadsheet
C. paint program
D. word processor
E. compiler only

20. PWM duty 64/255 is about

A. 25.1%
B. 90%
C. 50%
D. 100%
E. 10%

21. RX and TX pins are used for

A. only power
B. serial communication
C. only reset
D. only LEDs
E. only USB 5 V

22. digitalWrite(13, HIGH) typically

A. reads A0
B. erases Wi-Fi
C. formats a disk
D. turns an LED on pin 13 on
E. prints on paper

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23. analogRead returns a value from

A. 0 to 255 only
B. −100 to 100
C. 0 to 5 only
D. 0 to 1
E. 0 to 1023

24. A smart wearable reporting heart rate is IoT in

A. health care
B. only painting
C. only mining
D. only carpentry
E. only printing

25. Cloud services in IoT mainly

A. compile Pascal
B. store data and run logic remotely
C. replace all sensors
D. power the LED only
E. remove the Internet

26. INPUT_PULLUP on a reed switch means

A. ADC is 8-bit
B. the pin is always LOW
C. the pin reads HIGH when the door is closed
D. USB is disabled
E. Wi-Fi is off

27. At about 24.9 °C with ON=28 and OFF=26 the fan is

A. LOW (off)
B. uploading
C. resetting
D. compiling
E. HIGH

28. At about 29.8 °C the fan becomes

A. a CSS rule
B. a URL
C. LOW forever
D. HIGH (on)
E. a sensor

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29. LDR voltage divider in the dark (50 kΩ + 10 kΩ) is about

A. 5.000 V
B. 10.000 V
C. 0.833 V
D. 2.500 V
E. 0.000 V

30. After HTTP GET /off the sketch replies

A. Door OPEN
B. compile error
C. TV OFF
D. TV ON
E. Light: 820

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Paper II Part A – Structured questions

1. MDS boards *(8 marks)*

(i) Compare an MDS with a traditional computer. *(3 marks)*
(ii) List six features of an Arduino-style board. *(3 marks)*
(iii) Explain how the IDE loads a sketch. *(2 marks)*

2. Sensors, ADC and actuators *(8 marks)*

(i) Calculate V for raw 820 and the LED resistor (5 V, Vf 2 V, 20 mA). *(3 marks)*
(ii) Describe the LDR-controlled LED application. *(3 marks)*
(iii) Explain fan control with hysteresis using the readings [24.9, 29.8, 26.9, 25.4]. *(2 marks)*

3. IoT concepts *(8 marks)*

(i) Define IoT and state three needs it meets. *(3 marks)*
(ii) Describe four application areas with examples. *(3 marks)*
(iii) List five enabling technologies. *(2 marks)*

4. Remote IoT switch *(8 marks)*

(i) Draw and label the remote TV switch system. *(3 marks)*
(ii) Write the HTTP paths and pin actions for ON and OFF. *(3 marks)*
(iii) State two safety or testing steps before school Wi-Fi use. *(2 marks)*

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Paper II Part B – Essay questions

1. Building MDS applications *(10 marks)*

(i) Explain the role of sensors and actuators with examples from the syllabus apps. *(3 marks)*
(ii) Describe the LED blink, LDR, temperature-fan and door applications. *(4 marks)*
(iii) Show how you would connect the board to a PC and upload a sketch. *(3 marks)*

2. From MDS to IoT *(10 marks)*

(i) Explain how an MDS becomes part of an IoT system. *(3 marks)*
(ii) Design a remote classroom-lamp switch: hardware, software paths, block diagram. *(4 marks)*
(iii) Discuss needs and enabling technologies for that design. *(3 marks)*

3. Calculations and traces *(11 marks)*

(i) Work out V for raw 820, the dark divider voltage, and the LED resistor. *(4 marks)*
(ii) Trace the temperature program for readings [24.9, 29.8, 26.9, 25.4]. *(4 marks)*
(iii) Trace GET /on then GET /off on the remote switch. *(3 marks)*

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Exam tips

- MDS = programmable board with I/O pins.
- ADC: V = raw × 5 / 1024 (10-bit).
- R_LED = (Vcc − Vf) / I.
- LDR dark → low reading → LED on (if threshold logic).
- LM35: 10 mV/°C; T = V × 100.
- Hysteresis: different ON and OFF levels.
- Reed + INPUT_PULLUP: closed HIGH, open LOW.
- IoT = sense + connect + act over the Internet.
- Needs: remote control, monitoring, automation.
- Enablers: MDS, sensors, Wi-Fi, cloud, apps.
- Remote switch: GET /on → relay HIGH.
- Beyond boxes (ESP32, MQTT) are interest only.

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Answers and explanations

Paper I

1. **B** – MDS.
2. **C** – Direct I/O.
3. **D** – Analog.
4. **B** – 2^10 levels.
5. **E** – 820×5/1024.
6. **B** – (5−2)/0.02.
7. **D** – Below 400.
8. **E** – 10 mV/°C.
9. **B** – Stops chatter.
10. **D** – Sensor.
11. **C** – Toolchain.
12. **E** – USB.
13. **D** – IoT.
14. **A** – Remote control.
15. **C** – Farm.
16. **E** – Connectivity.
17. **A** – Relay.
18. **E** – GET /on.
19. **A** – Tiny web server.
20. **A** – 64/255.
21. **B** – Serial.
22. **D** – HIGH ≈ 5 V.
23. **E** – 10-bit.
24. **A** – Health.
25. **B** – Cloud.
26. **C** – Closed → HIGH.
27. **A** – ≤ 26.
28. **D** – >= 28.
29. **C** – 5×10/(50+10).
30. **C** – handleOff.

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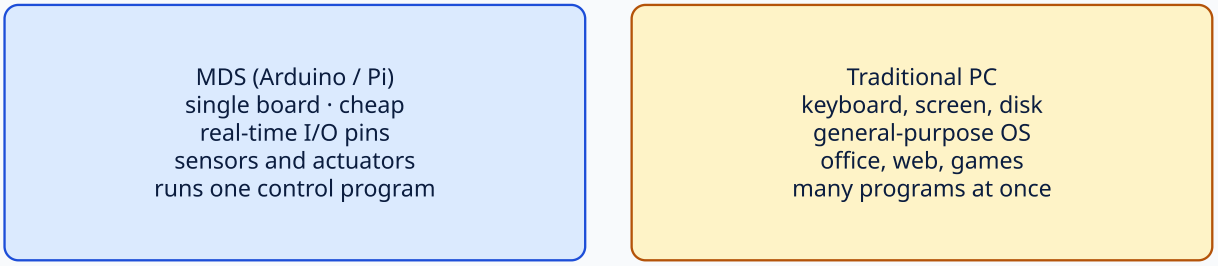
Paper II Part A – model answers and marking points

1. *(8 marks)*

(i) (3 marks)

I/O pins (1); real-time single program (1); size/cost (1).

MDS versus a traditional computer

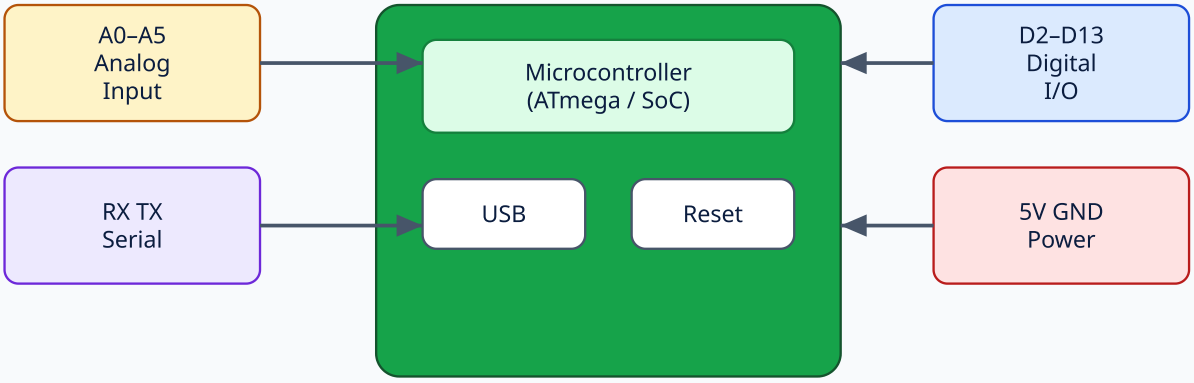


MDS vs PC.

(ii) (3 marks)

Analog, digital, MCU, RX/TX, USB, power/reset (3).

Arduino-style Microprocessor Development System



USB → PC (IDE: editor + compiler + programmer). Power from USB or barrel jack.

Board.

(iii) (2 marks)

Edit/compile (1); USB upload, board and port (1).

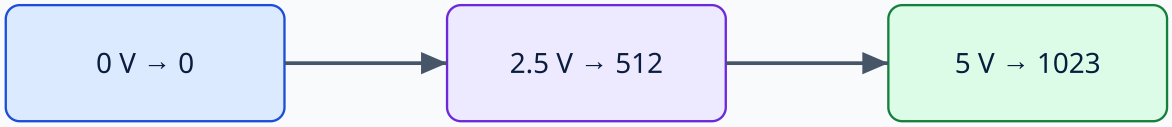
🎯 Examiner tip: name the USB cable and the COM port.

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2. *(8 marks)*

(i) (3 marks)
V ≈ 4.004 (2); R = 150 Ω (1).

10-bit ADC: voltage to a number



Step = Vref / 1024 ≈ 4.88 mV. V = raw × 5 / 1024.

LM35: 10 mV/°C → T (°C) = V × 100.

ADC.

(ii) (3 marks)
Voltage divider (1); threshold 400 (1); dark → LED on (1).

(iii) (2 marks)
ON at ≥28, OFF at ≤26 (1); middle reading keeps state (1).

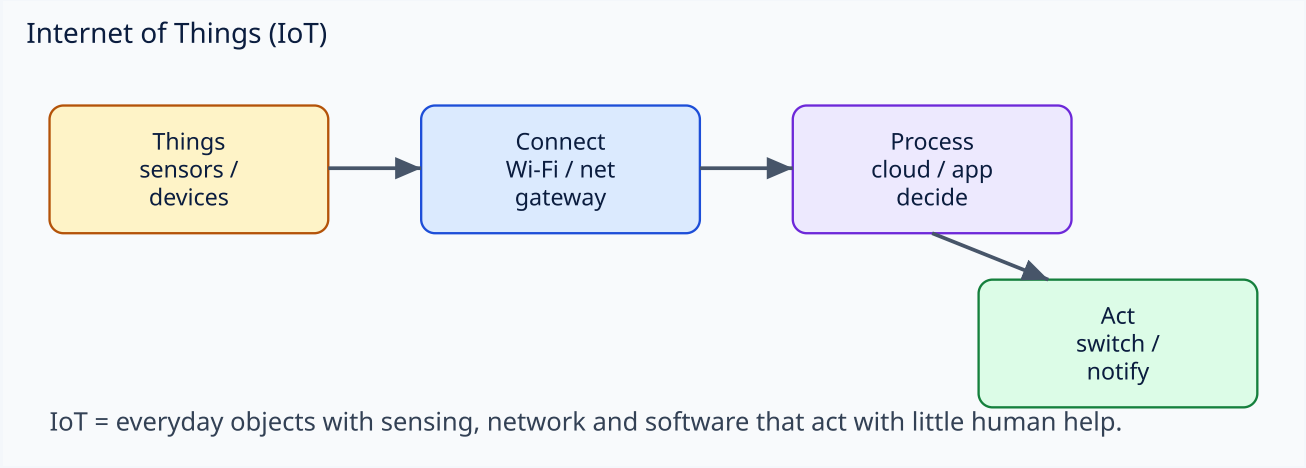
🎯 Examiner tip: show the formula V = raw × 5 / 1024.

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3. *(8 marks)*

(i) (3 marks)

Definition (1); three needs (2).



IoT.

(ii) (3 marks)

Four areas (2); examples (1).

(iii) (2 marks)

Any five of MDS, sensors, actuators, Wi-Fi, cloud, apps (2).

🎯 Examiner tip: keep the definition short and clear.

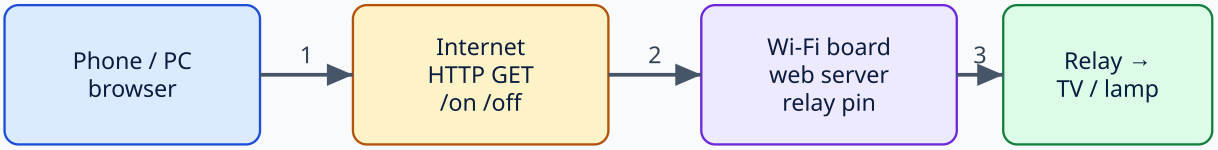
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4. *(8 marks)*

(i) (3 marks)

Browser, Internet, Wi-Fi board, relay, TV (3).

Simple IoT remote switch



Enabling technologies: microcontrollers, sensors, actuators, Wi-Fi/Internet, cloud, mobile apps.

Needs: remote control, monitoring, automation, energy saving, safety.

Applications: smart home, farm, health, transport, industry, cities.

Remote switch.

(ii) (3 marks)

/on → HIGH + TV ON (2); /off → LOW + TV OFF (1).

(iii) (2 marks)

Bench test with a lamp (1); password/HTTPS note (1).

🎯 Examiner tip: mark the relay as the actuator.

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Paper II Part B – model answers and marking points

1. *(10 marks)*

(i) (3 marks)

LDR/LM35/reed (2); LED/fan/alarm (1).

Sensors → MDS → actuators



Analog input (A0): 0–5 V → ADC → 0–1023. Digital I/O: HIGH ≈ 5 V, LOW ≈ 0 V.

LED resistor R = (Vcc − Vf) / I. Example: (5 − 2) / 0.02 = 150 Ω.

Sense → act.

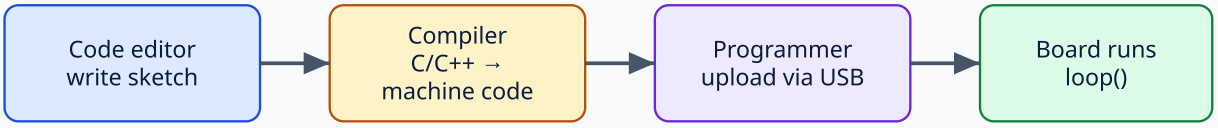
(ii) (4 marks)

One mark each for clear pin + logic.

(iii) (3 marks)

USB; IDE; board/port; compile; upload (3).

Arduino IDE toolchain



Download the IDE free from the Internet; select the board and the COM/serial port.

IDE.

🎯 Examiner tip: always name the pin numbers.

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2. *(10 marks)*

> **(i)** (3 marks)
> Local sense/act (1); network (1); remote UI/cloud (1).

> **(ii)** (4 marks)
> Wi-Fi MDS + relay (1); /on /off (1); diagram (2).

> **(iii)** (3 marks)
> Needs (1); enablers (2).

> 🎯 Examiner tip: separate local control from Internet control.

3. *(11 marks)*

> **(i)** (4 marks)
> 4.004 V (1); 0.833 V (1); 150 Ω with formula (2).

> **(ii)** (4 marks)
> Each reading + fan state (4).

> **(iii)** (3 marks)
> Relay HIGH + TV ON (1); Relay LOW + TV OFF (1); path names (1).

> 🎯 Examiner tip: write units (V, Ω, °C) on every answer.

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