



KAIMOSI FRIENDS UNIVERSITY (KAFU)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2025/2026 ACADEMIC YEAR

THIRD YEAR, 2ND SEMESTER EXAMINATIONS

BACHELOR OF SCIENCE IN INFORMATION

TECHNOLOGY

COURSE CODE: BIT 341E

COURSE TITLE: INTERNET OF THINGS

DATE 25/6/2026

TIME 12.00-2.00AM

INSTRUCTIONS TO CANDIDATES

- 1. ANSWER QUESTION ONE (1) AND ANY OTHER (2) QUESTIONS**
- 2. ENSURE YOUR ANSWERS/IDEAS ARE CLEARLY EXPRESSED ALL YOUR ANSWERS MUST BE CLEARLY NUMBERED**
- 3. WRITE IN INK.**
- 4. ROUGH WORK CAN BE DONE (IN ANSWER BOOKLET) IN PENCIL AND WILL NOT BE MARKED. CROSS OUT ANY ROUGH WORK.**
- 5. PHONES, TABLETS, COMPUTERS NOT ALLOWED**
- 6. TIME FOR THE EXAM IS 2 HOURS**

KAFU observes ZERO tolerance to examination cheating

QUESTION ONE (COMPULSORY)

- 1(a) Define the Internet of Things (IoT) and explain FOUR key characteristics relevant to IoT systems. [4 Marks]
- 1(b) Draw a clearly labeled circuit diagram for an IoT-based temperature monitoring system using: [6 Marks]
- Arduino Uno
 - DHT11 sensor
 - LED
 - 220Ω resistor
- Show VCC, GND and data pin connections.
- 1(c) Write a complete Arduino sketch that: [8 Marks]
- Reads temperature from DHT11
 - Displays the value on Serial Monitor
 - Turns ON LED when temperature > 30°C
 - Turns OFF LED otherwise
- 1(d) The following IoT code has logical errors: [6 Marks]
- ```
cpp

int sensor = A0;
int led = 7;
void setup(){

Serial.begin(9600);
}
void loop(){
 int value =
digitalRead(sensor);
 if(value > 30){
 digitalWrite(led,
HIGH);
 }
}

```
- i) Identify TWO errors.  
ii) Rewrite the corrected version.
- 1(e) Explain how sensors, actuators, and cloud services interact in a smart irrigation IoT system. Include a simple block diagram. [6 Marks]

### QUESTION TWO

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- 2(a) Draw a complete circuit diagram for a Smart Irrigation IoT system using: [8 Marks]
- ESP32
  - Soil Moisture Sensor
  - Relay Module
  - Water Pump
  - WiFi connection to Cloud
- 2(b) Write an ESP32 Arduino code snippet that: [6 Marks]
- Reads soil moisture value
  - Connects to WiFi
  - Sends data to a cloud platform (e.g., ThingSpeak)

- 2(c) Explain how MQTT protocol would improve efficiency compared to HTTP in this system. [6 Marks]

### QUESTION THREE

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- 3(a) Draw and explain a Publish-Subscribe architecture using MQTT showing: [6 Marks]
- Publisher
  - Broker
  - Subscriber
- 3(b) Design a Smart Home IoT circuit integrating: [6 Marks]
- PIR Motion Sensor
  - Buzzer
  - LED
  - Arduino
- 3(c) Write Arduino code that triggers the buzzer and LED when motion is detected. [8 Marks]

### QUESTION FOUR

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- 4(a) Draw a high-level Industrial IoT architecture including: [8 Marks]
- Temperature and Vibration Sensors
  - Gateway
  - Cloud Analytics
  - Dashboard
- 4(b) Write an Arduino code snippet to read analog vibration sensor values and send them via GSM module. [6 Marks]
- 4(c) Explain how predictive maintenance using IoT analytics reduces downtime and operational costs. [6 Marks]

### QUESTION FIVE

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- 5(a) Draw a Smart Agriculture IoT system architecture showing: [8 Marks]
- Soil sensors
  - Weather sensors
  - IoT Gateway
  - Cloud storage
  - Mobile Application
- 5(b) Write pseudocode for crop disease detection alert using sensor data thresholds. [6 Marks]
- 5(c) Identify TWO IoT security threats in agricultural IoT systems and propose mitigation strategies. [6 Marks]