

**INTRODUCTION TO INTERNET OF THINGS
(AEIE 3201)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**

- (i) The clock frequency of the micro-controller in Arduino UNO is
(a) 16 MHz (b) 1 kHz (c) 1 GHz (d) 3 GHz.
- (ii) The API key required to read from Consentium IoT server is
(a) Read Key (b) Write Key
(c) Channel ID (d) None of the above.
- (iii) The processor of Arduino UNO is
(a) 8 bit (b) 10 bit (c) 16 bit (d) 64 bit.
- (iv) The number of ADC ports in a NodeMCU is
(a) 2 (b) 1 (c) 5 (d) 10.
- (v) The MQTT protocol is
(a) Machine to Machine (b) Internet of Things
(c) Machine to Machine and Internet of Things (d) Machine Things.
- (vi) The protocol layer which LoRaWAN belongs to is
(a) Physical layer (b) Application layer
(c) Session layer (d) Transport layer.
- (vii) The pattern used by MQTT protocol is
(a) GET and PUT (b) POST
(c) INSERT (d) Publish and Subscribe.
- (viii) The function of the command “AT+RST” is
(a) Start a TCP server in the ESP-01 (b) Reset the ESP-01
(c) Prints all the available access point names (d) Does nothing.
- (ix) The resolution of the ADC in Raspberry Pi pico is
(a) 16 bit (b) 128 bit (c) 10 bit (d) 32 bit.

- (x) The resolution of the ADC in Arduino UNO is
(a) 16 bit (b) 128 bit
(c) 10 bit (d) Arduino doesn't have an ADC.

Group – B

2. (a) What are the various parts of an IoT system from the device perspective. [(C01)(Remember/LOCQ)]
(b) What role does cloud play in an IoT system? [(C02)(Understand/LOCQ)]
(c) Explain what do you understand by XaaS cloud service model? [(C01)(Evaluate/HOCQ)]
4 + 3 + 5 = 12
3. (a) What do you understand by retained messages in MQTT? [(C02)(Remember/LOCQ)]
(b) Explain the role of topics in MQTT? [(C01)(Evaluate/HOCQ)]
(c) List the advantages MQTT has over HTTP protocol. [(C01)(Analyse/IOCQ)]
3 + 4 + 5 = 12

Group – C

4. (a) Write a simple python class to accept data over USB serial at a given baud rate. Implement two class methods to initialize the serial connection and to calculate the average of gathered data. [(C02)(Remember/LOCQ)]
(b) How are private class variables declared in a Python class? [(C02)(Analyze/LOCQ)]
(c) What is the storage model a MongoDB database? [(C03)(Analyze/IOCQ)]
3 + 5 + 4 = 12
5. (a) Outline a Python code using Flask framework to return stored data in JSON format over a GET request. Consider running the server at localhost: 5000. [(C02)(Understand/LOCQ)]
(b) Develop a simple MicroPython code to read analog data from GPIO 28 in a Raspberry Pi pico. [(C03)(Apply/IOCQ)]
(c) Examine is the maximum code space requirement for MicroPython to run? [(C03,C02)(Analyze/IOCQ)]
5 + 4 + 3 = 12

Group – D

6. (a) What is the function of void loop() in an Arduino code? [(C04)(Remember/LOCQ)]
(b) Write an NodeMCU code to read temperature and humidity from a DHT-11 sensor and upload the data to Consentium IoT server. [(C05)(Remember/LOCQ)]

- (c) State the AT command used by the ESP-01 to connect with a WiFi access point.
 [(C05)(Analyze/IOCQ)]
6 + 3 + 3 = 12
7. (a) Write a simple NodeMCU code to read data from an analog temperature sensor and upload it to Consentium IoT Server. [(C04)(Understand /LOCQ)]
 (b) Which AT command is required to start a TCP server on the ESP 8266 WiFi module? [(C03, C04)(Remember/LOCQ)]
 (c) What is the function of void setup() in an Arduino code? [(C04)(Analyze/IOCQ)]
6 + 3 + 3 = 12

Group – E

8. (a) What is the role of loss function in an artificial neural network?
 [(C05)(Remember/LOCQ)]
 (b) What do you understand by learning rate of an optimizer?
 [(C05)(Understand/LOCQ)]
 (c) What do you understand by post-training quantization? [(C05)(Analyze/IOCQ)]
6 + 3 + 3 = 12
9. (a) List the advantages of running machine learning models on the edge in case of IoT applications.
 [(C05)(Remember/LOCQ)]
 (b) Why does TensorFlow lite use Flatbuffers for converted models?
 [(C05)(Understand/LOCQ)]
 (c) Explain with simple code how a Keras model can be converted into a TensorFlow lite mode?
 [(C06)(Evaluate/HOCQ)]
4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	60.42	26.04	13.54

Course Outcome (CO):

After the completion of the course students will be able to

1. Learn and familiarize the design challenges related to IoT systems.
2. Develop Python applications for IoT systems.
3. Demonstrate working knowledge of MicroPython on an ESP 8266 board.
4. Design of an IoT system with an Arduino and ESP 8266 for sensor data acquisition.
5. Understand functional components in an IoT Edge device.
6. Develop machine learning applications for microcontrollers.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question;
 HOCQ: Higher Order Cognitive Question

