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 API key required to read from Thingspeak server is
(a) Read Key (b) Write Key
(c) Channel ID (d) None of the above

(ii) The modulation technique used by NB-IoT is
(a) FSK (b) ASK
(c) QPSK (d) SS chirp

(iii) The MQTT protocol is
(a) Machine to Machine (b) Internet of Things
(c) Machine to Machine and Internet of Things (d) Machine Things

(iv) The major use of PaaS cloud is
(a) Building (b) Hosting
(c) Consumption (d) Compression

(v) The pattern used by MQTT protocol is
(a) GET and PUT (b) POST
(c) INSERT (d) Publish and Subscribe

(vi) The protocol layer which LoRaWAN belongs to is
(a) Physical layer (b) Application layer
(c) Session layer (d) Transport layer

(vii) Performing forward and backward passes on a neural network model with the entire data set is
(a) an iteration (b) a mini-batch
(c) an epoch (d) regression

(viii) The total number of digital I/O present in an Arduino UNO board is
(a) 8 (b) 14 (c) 13 (d) 9

(ix) The command to start a TCP server in the ESP-01 is
(a) AT+RST (b) AT+CWLAP
(c) AT (d) AT+CIPSTART

(x) The resolution of the ADC in Raspberry Pi pico is
(a) 16bit (b) 128bit
(c) 10bit (d) 32bit

Group – B

2. (a) State the various parts of an IoT system from the device perspective. What role does cloud play in an IoT system?

(b) Explain what do you understand by XaaS cloud service model? State a few points of difference between IaaS and SaaS cloud service.

(3 + 3) + (4 + 2) = 12

3. (a) How many Quality of Service (QoS) levels does the MQTT protocol have? Explain each QoS level in detail.

(b) List down few HTTP verbs used by REST. State an application where Narrow Band-IoT is used over convention IEEE 802.11 WiFi.

(3 + 3) + (3 + 3) = 12

Group – C

4. (a) What role does the def __init__(self): method play in a Python class? What are class methods?

(b) 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.

(2 + 2) + 8 = 12

5. (a) Write a simple Python code to demonstrate a MQTT subscriber at topic "home/temperature".

(b) Write a Python code using Flask framework to return stored data in JSON format over a GET request. Consider running the server at localhost:5000.

6 + 6 = 12

Group – D

6. (a) What is the maximum RAM requirement for MicroPython to run? Write a simple MicroPython code to read analog data from GPIO 28 in a Raspberry Pi pico.

(b) Write a simple Arduino code to read data from an analog temperature sensor and upload it to a RESTful server running at 192.168.0.100:5000 via an ESP-01. Draw necessary circuit diagram.

(1 + 5) + (4 + 2) = 12

7. (a) Which version of the ESP WiFi SoC does the ESP-01 use? What is the clock frequency of this SoC? State the AT command used by the ESP-01 to connect with a WiFi access point.

   (b) Write a simple Arduino code to read ambient temperature from an analog temperature sensor (i.e. LM35) and glow a notification LED (at pin 13) if the temperature goes above 80° Celsius.

(2 + 2 + 2) + 6 = 12

Group – E

8. (a) State how machine learning systems can be categorized based on the type of learning algorithm. What are hyper-parameters? Give one example of a hyper-parameter.

   (b) What role does the loss function play in an artificial neural network? What do you understand by learning rate on an optimizer?

(3 + 2 + 1) + (4 + 2) = 12

9. (a) List a few usage of unsupervised learning algorithms. Draw the structure of an artificial neuron and explain the role of activation function.

   (b) List the advantages of running machine learning models on the edge in case of IoT applications.

(2 + 2 + 3) + 5 = 12

Department & Section	Submission Link
AEIE	https://classroom.google.com/c/Mjk5ODA4ODA3OTA3/a/MzU3NDA3OTEzNjA4/details