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 number analog inputs in an Arduino UNO is
(a) 1 (b) 3 (c) 2 (d) 6.

(ii) The function of the statement delay (500) in Arduino UNO is
(a) to introduce a delay of 1s (b) to introduce a delay of 0.5s
(c) to introduce a delay of 500s (d) to introduce a delay of 2s.

(iii) The architecture used by ESP8266 is
(a) Xtensa (b) ARM (c) AVR (d) x86.

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

(v) L=[10,20,30,40,50,60,70,80,90,100]
The syntax to obtain [20, 40, 60, 80] from the given Python list is
(a) L[[1, 3, 5, 7]] (b) L[1, 3, 5, 7] (c) L[1::2] (d) L[1:-1:2].

(vi) The output of the following Python program is
>>a='Hello' + str(8)
(a) Hello8 (b) Hello 8
(c) Syntax Error (d) None of the above.

(vii) The function of the command "AT+CWLAP" 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.

(viii) The storage method in MongoDB is
(a) JSON (b) FAT32 (c) FAT (d) BSON.

(ix) 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.

(x) The number of QoS levels in MQTT is
(a) 3 (b) 4 (c) 1 (d) 2.

Group – B

2. (a) What is the role of Edge devices in an IoT system? [(CO1)(Remember/LOCQ)]
(b) Which is the modulation technique is used by LoRAWAN? [(CO2)(Understand/LOCQ)]
(c) Categorize the data representation formats used by RESTful API. [(CO1,CO2)(Analyze/IOCQ)]
4 + 3 + 5 = 12

3. (a) How many Quality of Service (QoS) levels does the MQTT protocol have? [(CO2)(Remember/LOCQ)]
(b) Explain how MQTT topics are framed using an example? [(CO1)(Evaluate/HOCQ)]
(c) List few features of MQTT protocol. [(CO1)(Analyse/IOCQ)]
3 + 4 + 5 = 12

Group – C

4. (a) Write a simple python class to accept employee name and surname via a parameterised constructor. Also implement a class method to print full name on the console. [(CO2)(Remember/LOCQ)]
(b) What is the role of the *self* keyword in a Python class? [(CO2)(Analyze/LOCQ)]
(c) Examine the role of private variables in a Python class. [(CO3)(Analyze/IOCQ)]
3 + 5 + 4 = 12

5. (a) Outline a Python code using Flask framework to store data in JSON format in a MongoDB over a GET request. Consider running the server at localhost:5000. [(CO2)(Understand/LOCQ)]
(b) Develop a simple MicroPython code to read DHT-11 data from GPIO 14 in a NodeMCU board. [(CO3)(Apply/IOCQ)]
(c) Write a simple MicroPython code to blink an LED at GPIO 14 in a NodeMCU board. [(CO3)(Analyze/IOCQ)]
5 + 4 + 3 = 12

Group – D

6. (a) Write a simple NodeMCU code to read data from an analog temperature sensor and upload it to Consentium IoT Server. [(CO4)(Understand /LOCQ)]
(b) Which AT command is required to start a TCP server on the ESP 8266 WiFi module? [(CO3, CO4)(Remember/LOCQ)]
(c) What is the function of void setup() in an Arduino code? [(CO4)(Analyze/IOCQ)]
6 + 3 + 3 = 12

7. (a) Which version of the ESP WiFi SoC does the ESP-01 use? [(CO4)(Remember/LOCQ)]
   (b) What is the clock frequency of this SoC? [(CO5)(Understand/LOCQ)]
   (c) State the resolution of the ADC in an ESP 8266. [(CO4,CO3)(Analyze/IOCQ)]

6 + 3 + 3 = 12

Group - E

8. (a) What is the difference between model.evaluate() and model.predict() in Keras? [(CO5)(Remember/LOCQ)]
   (b) What are hyper-parameters? [(CO6)(Understand/LOCQ)]
   (c) Give one example of a hyper-parameter. [(CO5)(Analyse/IOCQ)]

6 + 3 + 3 = 12

9. (a) Explain with simple code how a Keras model can be converted into a TensorFlow lite mode? [(CO6)(Evaluate/HOCQ)]
   (b) Draw the structure of an artificial neuron. [(CO6)(Understand/LOCQ)]
   (c) Explain the role of activation function. [(CO5)(Evaluate/HOCQ)]

4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	56.25	31.25	12.90

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.