PROGRAMMING LANGUAGE FOR EMBEDDED IOT SYSTEMS
(AEIE 5102)

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 CPU clock frequency of the Raspberry Pi 3 model B is
(a) 16MHz (b) 1 kHz (c) 1GHz (d) 3 GHz.

(ii) The resolution of the ADC in the Arduino UNO is
(a) 16bit (b) 128bit (c) 10bit (d) 32bit.

(iii) d = {0: 'a', 1: 'b', 2: 'c'}
for i in d.keys():
print(i)
The output of the code above is
(a) a b c (b) 0 1 2 (c) 0 a 1 b 2 c (d) 2c 1b 0a.

(iv) >>> s = 'Hello World'
>>> s[1] = 'a'
The output is seen at console is
(a) Hallo World (b) Hello World (c) ld (d) Type Error.

(v) Number of digital I/O in the Arduino board is
(a) 8 (b) 18 (c) 13 (d) 9.

(vi) The applications for Android Things are mostly written in?
(a) Objective C (b) Java (c) Kotlin (d) Both (b) and (c).

(vii) The MQTT protocol usage format is
(a) Publish/Subscribe (b) GET/POST
(c) GET/PUT (d) SEND/POST.

(viii) Identify which of the following best describes IoT systems
(a) An on-line banking
(b) An ATM
(c) A library book reservation system
(d) An AC that reports room temperature over an Android app.

(ix) Which protocol is lightweight?
(a) MQTT (b) HTTP (c) CoAP (d) SPI.

(x) The operator for a *to the power* b is
(a) a ^ b (b) a**b (c) a ^^ b (d) a ^ * b.

Group- B

2. (a) What are the advantages of using a conventional M2M network? [(CO5) (Remember/LOCQ)]
(b) Contrast on the importance of business analytics in an IoT application. [(CO6) (Analyze/IOCQ)]
(c) Determine the usage details of IaaS cloud service model? [(CO3)(Evaluate/HOCQ)]
4 + 5 + 3 = 12

3. (a) What are the inputs to a M2M value chain? [(CO6) (Remember/LOCQ)]
(b) Elaborate on some network protocols used by M2M solutions. [(CO3) (Create/HOCQ)]
(c) Identify two application areas where NB-IoT is used over conventional WiFi. [(CO2) (Apply/IOCQ)]
4 + 3 + 5 = 12

Group – C

4. (a) Distinguish between MQTT protocol from RESTful API. [(CO5) (Analyze/IOCQ)]
(b) What convention is used to define MQTT topics? [(CO3) (Understand/LOCQ)]
(c) Create a python function to accept a string. The function should print the same string after omitting the first and last characters. [(CO4)(Create/HOCQ)]
4 + 3 + 5 = 12

5. (a) How many message representation formats does RESTful API have? Explain each format in detail. [(CO5) (Remember/LOCQ)]
(b) Develop a simple Python code to demonstrate a MQTT subscriber for topic "home/room_0/humidity_1". [(CO2) (Understand/IOCQ)]
(c) Create a Python code using the Flask frame work to implement a RESTful API and use it to serve a GET request to return stored data in JSON format. [(CO3)(Create/HOCQ)]
3 + 4 + 5 = 12

Group – D

6. (a) Develop a NodeMCU code to read data from DHT-11 and upload it to Consentium server. [(CO4) (Analyze/IOCQ)]
(b) What role does void loop() play in an Arduino code? [(CO6) (Understand/LOCQ)]
(c) Create a simple MicroPython code to blink an LED at GPIO 25 in a Raspberry Pi Pico. [(CO1)(Create/HOCQ)]
4 + 3 + 5 = 12

7. (a) What is the minimum program space requirement for MicroPython to run? [(CO4) (Remember/LOCQ)]

   (b) Develop a simple MicroPython code to print serial data on the console. [(CO2) (Apply/IOCQ)]

   (c) Design a code to read data temperature and humidity sensor connected the NodeMCU board. [(CO1) (Create/HOCQ)]

2 + 4 + 6 = 12

Group – E

8. (a) What is the function of the send and receive API keys in Consentium server? [(CO3) (Remember/LOCQ)]

   (b) Contrast on the role of HAL in Android Things. [(CO6) (Analyze/IOCQ)]

   (c) Evaluate the role of network cards in the IoT device stack. [(CO1)(Evaluate/HOCQ)]

4 + 5 + 3 = 12

9. (a) Illustrate with a neat diagram the architecture of Android Things. [(CO4) (Understand/LOCQ)]

   (b) Contrast on the primary Cloud services that have native support for Android Things based devices? [(CO2) (Analyze/IOCQ)]

   (c) Determine the similarities M2M models have with IoT. [(CO1) (Evaluate/HOCQ)]

4 + 5 + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	28.16	37.50	34.34

Course Outcome (CO):

After the completion of the course students will be able to:

1. Interpret the vision of IoT from a global context.
2. Understand the key features, design challenges and related to IoT systems.
3. Learn the architecture of NodeMCU and develop IoT systems using it.
4. Demonstrate working knowledge of Micro Python.
5. Design an IoT system with functional requirements for hardware components including processor, networking components and sensors.
6. Develop an IoT system with along with applications of cloud.

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