

**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) What is the CPU clock frequency of the ESP 8266 WiFi module?  
(a) 16MHz (b) 80MHz  
(c) 11MHz (d) 3 GHz
- (ii) What does the command "AT+CWLAP" do?  
(a) Start a TCP server in the ESP-01  
(b) Rest the ESP-01  
(c) Prints all the available access point names  
(d) Does nothing
- (iii) The resolution of ADC in NodeMCU is  
(a) 8 bit (b) 10 bit  
(c) 16 bit (d) 32 bit
- (iv) `d = {0: 'a', 1: 'b', 2: 'c'}`  
for i in d:  
    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) None of these above
- (v) The processor of Arduino UNO is  
(a) 8 bit (b) 10 bit  
(c) 16 bit (d) 64 bit
- (vi) `>>> s = 'Hello World'`  
`>>> print s[-2:]`  
The following output is seen at console for the above Python code:  
(a) Hell (b) Hello World  
(c) ld (d) TypeError: string slicing not allowed

- (vii) What does `if __name__ == '__main__':` do in a Python code?  
(a) Tells the interpreter current code has main in it  
(b) It does nothing  
(c) Finds out the main method, executes it first  
(d) None of the above
- (viii) The output when `'1' == 1` is executed  
(a) False (b) True  
(c) ValueError occurs (d) TypeError occurs
- (ix) In order to read from Consentium server which API key is required?  
(a) Read Key (b) Write Key  
(c) Channel ID (d) Delete Key
- (x) What will be the output of the following Python program?  
`>>a='Hello' + 8`  
(a) Hello8 (b) Hello 8  
(c) Syntax Error (d) None of the above

### **Group - B**

2. (a) What advantage does an IoT system offer over conventional M2M networks?  
[[CO1] (Remember/LOCQ)]  
(b) Contrast on the various building blocks of an IoT application from business perspective. [[CO1] (Analyze/IOCQ)]  
(c) Determine XaaS considered the right service model for cloud IoT service providers? [[CO2] (Evaluate/HOCQ)]

**4 + 5 + 3 = 12**

3. (a) What do you understand by a M2M solution? [[CO2] (Remember/LOCQ)]  
(b) Elaborate on the four communication protocols used by M2M solutions.  
[[CO2] (Create/HOCQ)]  
(c) Identify two application areas where LoRaWAN is used over convention WiFi.  
[[CO3] (Apply/IOCQ)]

**4 + 3 + 5 = 12**

### **Group - C**

4. (a) What is the role of `def __init__(self):` in a Python class? [[CO5] (Remember/LOCQ)]  
(b) Distinguish between MQTT protocol from HTTP. [[CO2] (Analyze/IOCQ)]  
(c) Create a simple python class to implement an employee name and phone input system. Obtain the said information for at least two employees by a parameterised Python constructor. [[CO4] (Create/HOCQ)]

**4 + 2 + 6 = 12**

5. (a) How many Quality of Service (QoS) levels does the MQTT protocol have? Explain each QoS level in detail. [(CO5) (Remember/LOCQ)]  
(b) Develop a simple Python code to demonstrate a MQTT subscriber for topic "topic/test". [(CO5) (Understand/IOCQ)]  
(c) Create a Python code using the Flask frame work to implement a RESTapi and use it to serve a GET request to return stored data in JSON format. [(CO2) (Create/HOCQ)]

**3 + 4 + 5 = 12**

### **Group – D**

6. (a) What is the clock speed of the ESP WiFi SoC? [(CO4) (Remember/LOCQ)]  
(b) Design a simple code for the NodeMCU board to read ambient temperature from an LM35 and glow a LED at D2 (GPIO4), if the temperature goes above 50° C. [(CO4) (Create/HOCQ)]  
(c) Develop a simple Arduino code to read data of an analog temperature sensor and upload it to Consentium server via an ESP-01. Draw necessary circuit diagram. [(CO4) (Analyze/IOCQ)]

**2 + 4 + 6 = 12**

7. (a) What is the code space requirement for MicroPython? [(CO3) (Remember/LOCQ)]  
(b) Develop a simple MicroPython code to read analog values of a 10 kΩ potentiometer. [(CO4) (Apply/IOCQ)]  
(c) Create a python code to print the last uploaded data on the terminal from Consentium server using the request and JSON python modules. [(CO6) (Create/HOCQ)]

**2 + 4 + 6 = 12**

### **Group – E**

8. (a) What is the function of the read and write API keys in Consentium server? [(CO6) (Remember/LOCQ)]  
(b) Contrast on the difference's Android Things have over conventional Android mobile operating system. [(CO5) (Analyze/IOCQ)]  
(c) Evaluate the role of edge boards in the IoT device stack. [(CO6) (Evaluate/HOCQ)]

**4 + 5 + 3 = 12**

9. (a) What advantage does IoT have over WSN? [(CO5) (Remember/LOCQ)]  
(b) Outline the role of predictive maintenance in IoT. [(CO6) (Understand/IOCQ)]  
(c) Determine the list of programming languages officially supported by Google for Android Things? [(CO5)(Evaluate/HOCQ)]

**4 + 5 + 3 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	28.1%	37.5%	34.3%

**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

Department & Section	Submission Link
AEIE	<a href="https://classroom.google.com/c/NDAXNDkzMDg4MDMx/a/NDY0MTczODAzNjk0/details">https://classroom.google.com/c/NDAXNDkzMDg4MDMx/a/NDY0MTczODAzNjk0/details</a>