

**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 clock frequency of the micro-controller in Arduino UNO?  
(a) 16 MHz                      (b) 1 kHz                                      (c) 1 GHz                                      (d) 3 GHz
- (ii) `x = 'pqrs'`  
`for i in range(len(x)):`  
`x[i].upper()`  
`print (x)`  
The output of the python program is  
(a) PQRS                                      (b) pqrs                                      (c) Qrs                                      (d) None of these
- (iii) `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
- (iv) What does the command “AT+RST” 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
- (v) The total number of digital I/O present in a Raspberry Pi is  
(a) 8    (b) 18  
(c) 13                                      (d) 40
- (vi) The applications for Android Things are mostly written in  
(a) objective C                                      (b) java  
(c) kotlin                                      (d) both (b) and (c).
- (vii) `>>> s = 'Hello World'`  
`>>> print s[-2:]`  
The following output is seen at console for the above Python code:

- (a) Hell (b) Hello World  
(c) Id (d) TypeError: string slicing not allowed
- (viii) MQTT is \_\_\_\_\_ protocol.  
(a) Machine to Machine  
(b) Internet of Things  
(c) Machine to Machine and Internet of Things  
(d) Machine Things.
- (ix) In order to read from Thingspeak server, which API key is required?  
(a) Read Key (b) Write Key  
(c) Channel ID (d) None of the above.
- (x) Which of the following operators is the correct option for a *to the power b*?  
(a)  $a \wedge b$  (b)  $a^{**}b$   
(c)  $a \wedge \wedge b$ . (d)  $a \wedge * b$

### Group - B

2. (a) State the various parts of an IoT system from the device perspective. What role does cloud play in any IoT system?  
(b) Explain what do you understand by SaaS cloud service model? State a few points of difference between IaaS and SaaS cloud service.  
**(4 + 2) + (4 + 2) = 12**
3. (a) List down and briefly explain the system components of a M2M solution. How different are IoT applications from a M2M solution?  
(b) Why is data analytics a huge part of IoT applications? What role do sensors play in an IoT solution?  
**(3 + 3) + (3 + 3) = 12**

### Group - C

4. (a) Explain the basic difference between the MQTT protocols from HTTP. What roles does an MQTT broker play?  
(b) Write a simple python function to accept two strings as command line inputs and print it on the console after concatenating them.  
**(3 + 3) + 6 = 12**
5. (a) Write a simple Python code to publish a custom message under a selected topic using the paho MQTT client, using "mqtt.eclipseprojects.io" as the MQTT broker.  
(b) Write a Python code using the Flask frame work to implement a REST API and use it to serve a GET request by storing incoming data from the API in a mongoDB database. Consider running the server at IP address 127.0.0.1:5000.  
**6 + 6 = 12**

### Group - D

6. (a) What is the clock speed of the ESP WiFi SoC in a NodeMCU? Write a simple code for the NodeMCU board to read ambient temperature from an analog temperature sensor (i.e. LM35) and glow a notification LED if the temperature goes above 80° Celsius.
- (b) Write a python code to read the CPU temperature from a Raspberry Pi and publish it under the topic “temp/cpu” using the paho MQTT python module.  
**(2 + 4) + 6 = 12**
7. (a) What is the maximum RAM space requirement for MicroPython to run? Write a simple MicroPython code to read analog data from A0 in an ESP8266.
- (b) Write a python code to print the last uploaded data on the terminal from Thingspeak IoT server using the request and JSON python modules.  
**(2 + 4) + 6 = 12**

### Group - E

8. (a) Briefly explain the architecture of Android Things with a neat diagram. Which are the primary Cloud services that have native out of the box support for Android Things based devices?
- (b) What are the basic similarities that M2M models have with that of IoT solutions? State a few examples where M2M solutions are still used.  
**(4 + 2) + (3 + 3) = 12**
9. (a) How different is Android Things from the conventional Android mobile operating system? What are the primary programming languages officially supported by Google for Android Things?
- (b) Write short notes on any two:  
(i) Role of edge boards in the IoT device stack  
(ii) IoT versus Wireless sensor networks  
(iii) Data analytics for IoT applications.  
**(3 + 3) + (3 × 2) = 12**

Department & Section	Submission Link
AEIE	<a href="https://classroom.google.com/c/MjA1NDI2NzU1NTgw/a/MjcxNTEwNDU5NTQz/details">https://classroom.google.com/c/MjA1NDI2NzU1NTgw/a/MjcxNTEwNDU5NTQz/details</a>