

INDUSTRIAL INTERNET OF THINGS
(AEIE 5243)

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) In the following the protocol that is not a LPWAN technology is
 - (a) SigFox
 - (b) WiFi
 - (c) NB-IoT
 - (d) LoRa.
 - (ii) The modulation technique used for LoRa devices is
 - (a) FSK
 - (b) QPSK
 - (c) Chirp Spread Spectrum
 - (c) Frequency Hop Spread Spectrum.
 - (iii) The protocol that is not part of data link layer technology is
 - (a) Bluetooth
 - (b) UART
 - (c) WiFi
 - (d) HTTP.
 - (iv) The computing technology emphasizing on proximity to end user is
 - (a) Mist computing
 - (b) Cloud computing
 - (c) Edge computing
 - (d) Fog computing.
 - (v) MQTT protocol is
 - (a) message oriented protocol
 - (b) file oriented protocol
 - (c) web page oriented protocol
 - (d) email oriented protocol.
 - (vi) Among the following a lightweight protocol is
 - (a) MQTT
 - (b) HTTP
 - (c) CoAP
 - (d) SPI.
 - (vii) The pathway of Publish command message is
 - (a) publisher to broker
 - (b) broker to publisher
 - (c) publisher to broker and broker to publisher
 - (d) server to client.
 - (viii) The total number of slaves supported in a Bluetooth piconet is
 - (a) 1
 - (b) 2
 - (c) 6
 - (d) 7.

- (ix) The cloud service model preferred in IIoT applications is
(a) CaaS (b) XaaS
(c) SaaS (d) IaaS.
- (x) The multiple access technique used by IEEE 802.11 standard for wireless LAN is
(a) ALOHA (b) CSMA/CA
(c) CDMA (d) None of the mentioned.

Group - B

2. (a) What do you understand by a M2M solution? [(CO1)(Remember/LOCQ)]
(b) Outline a few communication protocols other than MQTT that are used by IIoT systems. [(CO2)(Understand/LOCQ)]
(c) List a few communication protocols other than MQTT that are used by IIoT systems. [(CO1)(Analyze/IOCQ)]
4 + 5 + 3 = 12
3. (a) What role does an Edge computer play in an IIoT system? [(CO2)(Remember/LOCQ)]
(b) Outline the importance of asset layer in an IIoT framework? [(CO3)(Understand/LOCQ)]
(c) Interpret the inputs to an M2M value chain? [(CO2)(Analyze/IOCQ)]
4 + 4 + 4 = 12

Group - C

4. (a) What are the characteristics of CoAP protocol? [(CO4)(Remember/LOCQ)]
(b) Inspect how CoAP is different from HTTP protocol. [(CO2)(Analyze/IOCQ)]
(c) Identify the protocol standard the ZigBee radios use. [(CO3)(Apply/IOCQ)]
5 + 3 + 4 = 12
5. (a) Which physical layer modulation does Bluetooth use? [(CO4)(Remember/LOCQ)]
(b) Explain what is a Bluetooth piconet. [(CO3)(Understand/LOCQ)]
(c) Identify the various attributes of Bluetooth low energy. [(CO3)(Apply/IOCQ)]
4 + 4 + 4 = 12

Group - D

6. (a) What benefits do LoRa network have over NB-IoT? [(CO4)(Remember/LOCQ)]
(b) Explain what do you understand by IaaS cloud service model? [(CO5)(Understand/LOCQ)]
(c) Examine in details the role security and application layer play in IIoT functional layers? [(CO4)(Analyze/IOCQ)]
3 + 4 + 5 = 12

7. (a) Explain in details what role does the security layer play in IoT functional layers? [(C04)(Understand/LOCQ)]
(b) What is the frequency bandwidth for NB-IoT? [(C04)(Remember/LOCQ)]
(c) Analyse the role of data management in an IIoT application. [(C05)(Analyze/IOCQ)]
4 + 3 + 5 = 12

Group - E

8. (a) Explain the various building blocks of an NB-IoT application. [(C06)(Understand/LOCQ)]
(b) Show using an example what role does predictive maintenance play in IIoT services? [(C06)(Remember/LOCQ)]
(c) Discuss with two examples where M2M solutions are used over IIoT. [(C05)(Analyze/IOCQ)]
4 + 3 + 5 = 12
9. (a) Which is the transport layer protocol do IIoT systems use? [(C06)(Remember/LOCQ)]
(b) List down the various constraints of a RESTful architecture. [(C05)(Understand/LOCQ)]
(c) Contrast on the role of application layer play in an IIoT solution? [(C05)(Analyze/IOCQ)]
4 + 5 + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	62.5	37.5	0

Course Outcome (CO):

After the completion of the course students will be able to

1. Determine the IIoT architecture and application in various fields.
2. Distinguish building blocks of Internet of Things and characteristics.
3. Outline the concept of NB-IoT and LoRa.
4. Realize the importance of security and privacy issues in IIoT.
5. Interpret the concept of IIoT and M2M.
6. Point out the applications of IIoT in various industries.

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

