

**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 protocols that is not a M2M technology is
(a) SigFox (b) WiFi (c) NB-IoT (d) LoRa.
 - (ii) An interconnected collection of piconet is
(a) micronet (b) scatternet (c) mininet (d) None of the mentioned.
 - (iii) Standard port used by MQTT is
(a) I2C (b) SSL (c) USART (d) TCP/IP.
 - (iv) The frequency band used by ZigBee for world-wide application user is
(a) 433 kHz (b) 868 kHz (c) 2.4 GHz (d) 915 kHz.
 - (v) The layer of OSI reference model at which a router operates is
(a) Layer 2 (Data Link) (b) Layer 3 (Network)
(c) Layer 1 (Physical) (d) Layer 4 (Transport).
 - (vi) The maximum data rate in WiFi is
(a) 300 Mbps (b) 100 Mbps (c) 150 kbps (d) 300 kbps.
 - (vii) The data rate in LoRa devices is
(a) 50 kbps (b) 290 bps
(c) 290 Mbps - 50 Gbps (d) 290 bps - 50 kbps.
 - (viii) The operation range of Class 1 Bluetooth is
(a) 1 m (b) 100 m (c) 6 m (d) 7 m.
 - (ix) The architecture MQTT protocol uses is
(a) client-server (b) publish-subscribe architecture
(c) master-slave architecture (d) point-point architecture.
 - (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 value chain in a M2M solution? [(CO1)(Remember/LOCQ)]
(b) Outline the value chains in an M2M taking an example. [(CO2)(Understand/LOCQ)]
(c) What are the various network cellular and capillary protocols used by M2M application? [(CO1)(Analyze/IOCQ)]
4 + 5 + 3 = 12
3. (a) Explain the various parts of an IIoT network? [(CO2)(Understand/LOCQ)]
(b) What is the relevance of topics in MQTT? [(CO3)(Remember/LOCQ)]
(c) What role does an fog computer play in an IIoT system? [(CO2)(Remember/LOCQ)]
5 + 3 + 4 = 12

Group - C

4. (a) What are the attributed of a peer to peer communication network? [(CO4)(Remember/LOCQ)]
(b) Examine the role of PAN coordinator in a peer to peer communication network? [(CO3)(Analyze/LOCQ)]
(c) List down some applications where ZigBee network is used. [(CO3)(Analyze/IOCQ)]
4 + 5 + 3 = 12
5. (a) Identify the data rate range of Bluetooth low energy devices. [(CO3)(Apply/IOCQ)]
(b) List the differences Bluetooth has over ZigBee protocol? [(CO3)(Remember/LOCQ)]
(c) Examine the maximum power draw and range of a BLE enabled radio? [(CO4)(Analyze/IOCQ)]
4 + 5 + 3 = 12

Group - D

6. (a) What benefit does real time scheduling provide in case of LoRa networks? [(CO4)(Remember/LOCQ)]
(b) Contrast on the basic features of NB-IoT systems. [(CO3)(Understand/LOCQ)]
(c) Interpret the physical layer modulation technique LoRa modules use. [(CO4)(Analyze/IOCQ)]
5 + 4 + 3 = 12
7. (a) Explain the advantage of mesh networking in ZigBee devices. [(CO4)(Understand/LOCQ)]
(b) What is the frequency bandwidth for ZigBee? [(CO4)(Remember/LOCQ)]

- (c) Analyse the difference between WiFi, ZigBee and Bluetooth.

[(CO5)(Analyse/IOCQ)]

4 + 3 + 5 = 12

Group - E

8. (a) Explain the various building blocks of an LoRa application.

[(CO6)(Understand/LOCQ)]

- (b) Contrast on the role of application layer play in an IIoT solution.

[(CO5)(Analyse/IOCQ)]

- (c) Discuss with two examples where ZigBee solutions are used over IIoT.

[(CO5)(Analyse/IOCQ)]

4 + 3 + 5 = 12

9. (a) What do you understand by service support layer in an IIoT system?

[(CO5)(Remember/LOCQ)]

- (b) Explain what do you understand by M2M communication?

[(CO5)(Understand/LOCQ)]

- (c) Assess the difference between a conventional wireless sensor network from IIoT system.

[(CO6)(Evaluate/HOCQ)]

4 + 3 + 5 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	64.58	30.21	5.21

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.

