IOT ARCHITECTURE AND PROTOCOLS
(IOT2204)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) What are the primary layers of the IoT architecture?
(a) Sensing, Network, Data processing, and Application layers
(b) Sensing, Data processing, and Application layers
(c) Network, Data processing, and Application layers
(d) Sensing, Network, and Application layers

(ii) Which of the following is a common communication technology used in IoT?
(a) ZigBee (b) 4G LTE
(c) Bluetooth Low Energy (BLE) (d) All of the above

(iii) Which of the following is NOT typically considered a form of XaaS?
(a) Infrastructure as a Service (IaaS) (b) Platform as a Service (PaaS)
(c) Software as a Service (SaaS) (d) Desktop as a Service (DaaS)

(iv) What is the primary role of the Network Layer in IoT architecture?
(a) Data storage and retrieval
(b) Communication between devices and the cloud
(c) Data processing and analysis
(d) Application interface management

(v) Which of the following is a major security concern for IoT devices?
(a) High processing power
(b) Unauthorized access and data breaches
(c) Large storage capacity
(d) Device weight

(vi) DASH7 is commonly used for
(a) Long-range, low-power wireless communication
(b) High-speed data transfer
(c) Mobile network communication
(d) Video streaming

(vii) What is the primary function of the IEEE 802.15.4 standard?
(a) To define Ethernet standards for large-scale networks
(b) To provide a physical and MAC layer for low-rate wireless communication
(c) To manage communication protocols for wide-area networks
(d) To ensure high-throughput communication for short-range communication

(viii) What is the primary feature of TCP?
(a) Connectionless communication (b) Guaranteed delivery
(c) Low latency (d) Broadcast transmission

(ix) Which message transmission model is used by MQTT?
(a) Request-response (b) Peer-to-peer
(c) Publish-subscribe (d) Point-to-point

(x) Which protocol is used to secure communication over transport layer protocols like TCP, ensuring data integrity, confidentiality, and authentication?
(a) DTLS (b) TLS
(c) HTTP (d) SCTP

Fill in the blanks with the correct word

(xi) The IEEE standard which is commonly associated with Wi-Fi is ____.

(xii) 6LoWPAN enables IPv6 packets to be transmitted over ____ network standard.

(xiii) HTTP uses ___ communication over the web.

(xiv) CoAP operates over _____ transport layer protocol for efficient communication in constrained environments.

(xv) _____ is a key feature of IoT system design that involves selecting protocols like Wi-Fi, ZigBee, or LoRa.

Group - B

2. (a) How does the integration of IoT and business process management hold a significant potential for businesses in the modern digital landscape? *[(CO2)(Understand/HOCQ)]*
(b) Discuss the primary IoT design principles. *[(CO1)(Remember/LOCQ)]*
(c) What are the primary functions of AMQP? *[(CO2)(Remember/LOCQ)]*
6 + 4 + 2 = 12

3. (a) Discuss different components of IoT logical design. *[(CO1)(Understand/LOCQ)]*
(b) Compare LoRaWAN, 6LoWPAN, and LWM2M. *[(CO2)(Analyse/IOCQ)]*
(c) Which types of IoT design are suitable for using CoAP and WebSocket protocols? *[(CO2)(Remember/LOCQ)]*
4 + 6 + 2 = 12

Group - C

4. (a) Describe popular tools used for IoT data visualization. *[(CO4)(Understand/LOCQ)]*

(b) Explain the design challenges in creating connected devices that are both functional and secure. *[(CO4)(Understand/IOCQ)]*

(c) Differentiate between IoT information model and functional model under IoT ARM? *[(CO3)(Analyse/HOCQ)]*

5 + 5 + 2 = 12

5. (a) Explain how the appropriate selection of sensors and actuators influence the overall system performance in IoT hardware design. *[(CO4)(Understand/HOCQ)]*

(b) How does the information view in the IoT reference architecture contribute to the efficient management and processing of data in IoT systems? *[(CO3)(Analyse/IOCQ)]*

(c) What are the best practices for designing real-time data dashboards for IoT systems? *[(C4)(Remember/LOCQ)]*

5 + 5 + 2 = 12

Group - D

6. (a) Explain the key features and concepts of 3GPP MTC. *[(CO5)(Understand/LOCQ)]*

(b) Discuss the properties of 6TiSCH. *[(CO5)(Remember/LOCQ)]*

(c) How is class A IP address differentiated from class C IP address? *[(CO5)(Analyse/IOCQ)]*

5 + 5 + 2 = 12

7. (a) Explain the classful IP addressing technique applied in IPv4. *[(CO5)(Understand/IOCQ)]*

(b) What is the role of DHCP in networking? *[(CO5)(Understand/LOCQ)]*

(c) Describe the working principle of destination un-reachable message in ICMP. *[(CO5)(Understand/IOCQ)]*

6 + 4 + 2 = 12

Group - E

8. (a) What are the two main protocols of transport layer? Compare these protocols. *[(CO6)(Analyse/IOCQ)]*

(b) Which functional model can be addressed by MQTT in IoT architecture reference view? Explain with an example. *[(CO3/CO6)(Understand/HOCQ)]*

(c) What are the goals for MPTCP? *[(CO6)(Understand/LOCQ)]*

(2 + 3) + 5 + 2 = 12

9. (a) Describe the ETSI M2M high-level architecture. *[(CO6)(Understand/LOCQ)]*

(b) Design an IoT-based smart parking system, by mentioning different protocols which will be applied in different networking layers like date link, network, transport, and application layers. *[(CO1/CO6)(Apply/HOCQ)]*

4 + 8 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	40.62	32.29	27.08