IoT FOR COMMUNICATION
(ECEN 3232)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> 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)   How to secure the secret keys on an IOT gateway?
            (a) Using secure storage   (b) Secure by backup
            (c) Keys not stored in devices   (d) Not possible to secure secret keys.

    (ii)   In TCP/IP layers, the application layer is the combination of the following OSI layers
            (a) Application, Presentation and Session
            (b) Application, Presentation and Transport
            (c) Application, Session and Transport
            (d) None of these.

    (iii)   Which of the following layers provides end-to-end communication in IoT?
            (a) Logical layer   (b) Session layer
            (c) Transport layer   (d) Data link layer.

    (iv)   In IPv4, Class B IP addresses range from
            (a) 0.0.x.x to 255.255.x.x   (b) 64.0.x.x to 191.255.x.x
            (c) 128.0.x.x to 191.255.x.x   (d) 128.0.x.x to 255.255.x.x

    (v)   RFID tags
            (a) are not LOS   (b) may be encrypted
            (c) can read multiple tags simultaneously (d) all are true.

    (vi)   802.15.4 focuses on
            (a) low complexity   (b) extended battery life
            (c) ISM band operation   (d) all three.

    (vii)   Which is not an IoT communication model?
            (a) Request-Response   (b) Push-Producer
            (c) Publish-Subscribe   (d) Exclusive Pair.

(viii) Which one of the following is not an IoT device?
     (a) Amazon echo voice controller   (b) Google Home
     (c) Nest Smoke Alarm   (d) None of these.

(ix) For EV charging, Level 2 using J1772 defines the following
     (a) 240V, single phase, up to 40A   (b) 240V, single phase, up to 80A
     (c) 420V, single phase. up to 80A   (d) 240v, two phases, up to 80A.

(x) Which of the following devices is used to measure the gases or liquid?
     (a) Smoke sensor   (b) Pressure sensor
     (c) Optical sensor   (d) Gas sensor.

Group- B

2. (a) Which is the main component of the Internet layer? Draw the block diagram of a Router showing the different components. Explain the functions of the Flash memory and the NVRAM.   [(CO1)(Remember/LOCQ)]
    (b) Write down the equation for total end-to-end delay in aIoT network. Why do queuing delay and processing delay take place?   [(CO1)(Understand/IOCQ)]
    (c) Explain the differences between Classes A, B and C as applicable to Internet addressing scheme with the help of a diagram. Why is the maximum number of host addresses reduced by 2?   [(CO1)(Understand/IOCQ)]
4 + 4 + 4 = 12

3. (a) The development of IoT is seeing the rapid convergence of information and operations technology. Explain this statement.   [(CO1)(Understand/IOCQ)]
    (b) What are the factors which have helped M2M to upgrade to IoT? Describe them briefly.   [(CO2)(Remember/LOCQ)]
    (c) What are the elements of a typical M2M system? Explain with a block diagram.   [(CO2)(Understand/IOCQ)]
2 + 4 + 6 = 12

Group - C

4. (a) Why IEEE 802.15.4 standard is suitable for IoT based communication system?   [(CO2)(Apply/IOCQ)]
    (b) Explain the fundamental network topologies used in IEEE 802.15.4 standard.   [(CO2)(Remember/LOCQ)]
    (c) What are the influencing factors are considered to calculate the end-to-end delay. How end-to-end delay differs from jitter?   [(CO2)(Apply/IOCQ)]
3 + 4 + (3 + 2) = 12

5. (a) What is meant by data analytics at the edge in IoT? Why is the importance of analytics gaining ground fast? Compare Analytics 1.0, 2.0 and 3.0 with respect to at least three parameters.   [(CO1,CO2)(Understand/IOCQ)]

(b)   What is meant by active/intelligent sensors? What are its differences with passive sensors? Explain the functioning of pressure sensors and flow sensors with suitable examples.   [(CO3)(Analyze/HOCQ)]

6 + 6 = 12

Group - D

6.   (a)   What is REST? Why is Roy Fielding credited for this architecture? What are the constraints of "RESTful" architecture? Explain them.

[(CO4)(Understand/IOCQ)]

(b)   What is the driving thought behind development of ZigBee Smart Energy (SE) 2.0 as an improvement upon SE 1.0? What are the functions of "Registration" and "Authorization Server" in ZigBee SE 2.0?   [(CO4)(Remember/LOCQ)]

6 + 6 = 12

7.   (a)   Why M-BUS is an important development in the IoT area? What are the four layers of the M-BUS architecture? Explain then operations of two layers.

[(CO3)(Remember/LOCQ)]

(b)   Explain how security is implemented in M-BUS. What are the encoding methods employed in M-Bus? Explain briefly. What is the T-mode?

[(CO3)(Understand/IOCQ)]

6 + 6 = 12

Group - E

8.   (a)   Why was 6LoWPAN standard for IoT required? Low power networks must work with mesh like networks. What are the two techniques used for this purpose? Explain the working of both.   [(CO5)(Analyse/HOCQ)]

(b)   What are the main issues which have been solved by 6LoWPAN? Explain the issues and their solutions.   [(CO5)(Understand/IOCQ)]

(2 + 4) + (2 + 4) = 12

9.   (a)   Justify how IoT can help immensely to make transport sector smart?

[(CO6)(Evaluate/HOCQ)]

(b)   What are the difference between different EV connector used in charging system?   [(CO6)(Remember/LOCQ)]

(c)   What are the IEC standard cases related to EV charging?

[(CO6)(Understand/LOCQ)]

6 + 3 + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	31.25	50	18.75

Course Outcomes (CO):

1. The students will know about IoT and the concept behind.
2. Students will be able to explain about the importance of radio transmission for IoT applications and different standards to match varying requirements, M2M area network, Physical Layers, IEEE 802.15.4 family of protocols.
3. They will be able to explain M2M protocols for Sensor networks and be able to apply knowledge for building and home automation.
4. The students will know about ZigBee and ZigBee smart energy protocols.
5. The students will know about next generation IP-based protocols like 6LoWPAN and RPL.
6. They should be able to analyze communication systems with ideas from Smart Grid and Electric Vehicle Charging projects.

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