

**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
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) Process of digitally signing software's on an IOT device is called
 - (a) Secure code
 - (b) Code signing
 - (c) Digital signature
 - (d) None of the above.
 - (ii) 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.
 - (iii) For a packet of length 10 Kbits and a link speed of 100 Mbps, the transmission delay will be
 - (a) 0.01 msecs
 - (b) 1.0 msec
 - (c) 10 microseconds
 - (d) 0.1 msecs.
 - (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) LLN in 6LoWPAN layer stands for
 - (a) Low Power Lossy Networks
 - (b) Low Power Low Noise
 - (c) Lossy and Low Networks
 - (d) none of these.
 - (viii) 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.

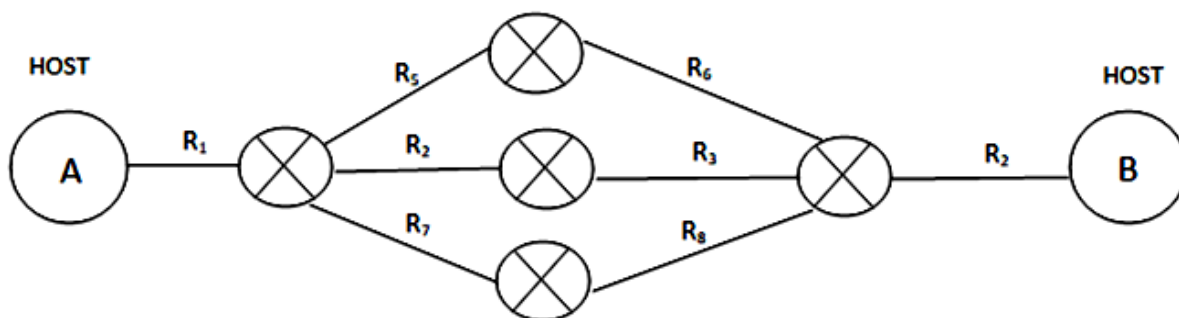
- (ix) Which is not an IoT communication model?
(a) Request-Response (b) Push-Producer
(c) Publish-Subscribe (d) Exclusive Pair.
- (x) Which one of the following is not an IoT device?
(a) Amazon echo voice controller (b) Google Home
(c) Nest Smoke Alarm (d) None of these.

Group- B

2. (a) It started with the concept of IoT and has been upgraded to IoE. Show with the help of Venn Diagrams, the differences between the earlier model and the Cisco model. What is the importance of “Processes and Standards” module?
[[CO1](Remember/LOCQ)]
- (b) Write down the equation for total end-to-end delay in an IoT network. Why do Queuing delay and Propagation delays take place? Why is propagation delay independent of packet length?
[[CO1](Understand/IOCQ)]
- (c) Explain the differences: (i) The IP address range for Class A is from 1 to 127; (ii) The IP address range for Class B is from 128 to 191 and, (iii) The IP address range for Class C is from 224 to 239. Why is the number of host addresses reduced by 2?
[[CO1](Understand/IOCQ)]
 $4 + 4 + 4 = 12$
3. (a) What are the various types of deployment challenges associated with the IoT system? Explain briefly.
[[CO1,CO2](Analyse/IOCQ)]
- (b) Why collected data filtering and optimization of power consumption is necessary for IoT based sensors?
[[CO1,CO2](Evaluate/HOCQ)]
- (c) What is the signification of IoT actuators?
[[CO1,CO2](Apply/IOCQ)]
 $5 + 5 + 2 = 12$

Group - C

4. (a)



Assuming host A is transferring a large file to host B. What is the throughput between host A and host B for the network shown here? Work out for both A and B and justify your answer.

A. Assumptions:

- The speed of each router is higher than the speed of any link in the network.
- No other host is sending data.
- $R2 = R3 = R5 = R6 = R7 = R8 = 10 \text{ Mbps}$.

- R1 = R4 = 100 Mbps.
- Data is equally divided between the three paths.

B. Assumptions:

- The speed of each router is 1 Mbps.
 - No other host is sending data.
 - R2 = R3 = R5 = R6 = R7 = R8 = 10 Mbps.
 - R1 = R4 = 100 Mbps.
 - Data is equally divided between the three paths. [(CO2)(Analyse/HOCQ)]
- (b) 802.15.4 networks are composed of different types of devices. Name and explain their working.

What are the two topologies which can be used in a network? Explain them.

[(CO3)(Remember/LOCQ)]

6 + 6 = 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,C02)(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 ZigBeeSmart 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) How packet is transferred using RPL routing scheme? Why it is called destination-oriented routing protocol? [(CO5)(Evaluate/HOCQ)]
- (b) What are the four layers of the M-BUS architecture? Briefly explain the working Scheme of M-BUS architecture? [(CO5)(Understand/LOCQ)]

(4 + 2) + (2 + 4) = 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/IOCQ)]
- (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) Electric Vehicle (EV) charging has to address a number of challenges. Mention three of them and explain the challenges and possible solutions. [(CO4)(Remember/LOCQ)]
- (b) What are the different charging modes prescribed by IEC? Explain modes 1 and 3. [(CO4)(Analyse/HOCQ)]
- (c) Explain how the pilot wire circuit as per IEC 61-851 work. Explain with the help of a circuit diagram. [(CO4)(Analyse/HOCQ)]
- 3 + 4 + 5 = 12**
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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	26.04	40.63	33.33

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.