



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

TUTORIAL QUESTION BANK

| | | |
|---------------------------|---|--|
| Course Name | : | IoT & APPLICATIONS |
| Course Code | : | AEC802 |
| Class | : | B. Tech VI Semester |
| Branch | : | ECE |
| Regulation | : | R16 |
| Year | : | 2019 – 2020 |
| Course Coordinator | : | Mr. T Vinay Simha Reddy, Assistant Professor |
| Course Faculty | : | Mr. T Vinay Simha Reddy, Assistant Professor |

COURSE OBJECTIVES:

| | |
|--|--|
| The course should enable the students to: | |
| I | Understand the architecture of Internet of Things and connected world. |
| II | Explore on use of various hardware and sensing technologies to build IoT applications |
| III | Illustrate the real time IoT applications to make smart world |
| IV | Understand the available cloud services and communication API's for developing smart cities. |

COURSE OUTCOMES (COs):

| | |
|------|--|
| CO 1 | Understand the design, characteristics and technologies of Internet of Things |
| CO 2 | Understand basics of IoT networking ,system management and analyze the network function virtualization |
| CO 3 | Understand the architecture of Internet of Things and connected world and Logical design using Python |
| CO 4 | Analyze the IoT physical devices and endpoints along with programming concepts by using Raspberry PI with Python |
| CO 5 | Understand the available cloud services and communication API's for developing different IoT applications |

COURSE LEARNING OUTCOMES (CLOs):

Students, who complete the course, will have demonstrated the ability to do the following:

| CLO Code | At the end of the course, the student will have the ability to: |
|-----------|--|
| AEC802.01 | Understand and intuition of the whole process line of extracting knowledge from data about the Internet of Things. |
| AEC802.02 | Deep insight in one of the specializations within the network, depending on the study and the choice of the concepts of IoT. |
| AEC802.03 | Solid knowledge in a broad range of methods based on design and implementation of IoT in network performance, analysis and problem solving with design of networks |
| AEC802.04 | Experience in deriving theoretical properties of methods involved in IoT. |
| AEC802.05 | Design and implementation/modification of methods involved in IoT. |
| AEC802.06 | Describe what IoT is and the skill sets needed to be a network analysis. |
| AEC802.07 | Motivate and explain trade-offs in IoT tool technique design and analysis of applications with IoT. |
| AEC802.08 | Understand significance of models in IoT. |
| AEC802.09 | Describe the Transport layer protocols and how its uses in IoT |
| AEC802.10 | Apply basic IoT algorithms for predictive network performance |
| AEC802.11 | Understand basic terms what security issues. Identify key distribution methods. |
| AEC802.12 | Identify common approaches used for Feature Generation of IoT. |
| AEC802.13 | Identify common approaches used for Feature Generation of IoT |
| AEC802.14 | Create effective results by using various techniques in IoT application. |
| AEC802.15 | Analyze the importance of IoT applications and work effectively as individual or teams on various IoT projects. |

UNIT – I
INTRODUCTION TO INTERNET OF THINGS (IoT)

PART – A (SHORT ANSWER QUESTIONS)

| S. No | Questions | Blooms Taxonomy Level | Course Outcome | Course Learning Outcome |
|-------|--|-----------------------|----------------|-------------------------|
| 1 | What is IoT? Write short notes on IoT. | Remember | CO1 | AEC802.1 |
| 2 | List any four characteristics of IoT. | Remember | CO1 | AEC802.1 |
| 3 | State the importance of IoT. | Remember | CO1 | AEC802.1 |
| 4 | What is the Thing in IoT? | Understand | CO1 | AEC802.1 |
| 5 | State about the importance of Thing in IoT. | Remember | CO1 | AEC802.2 |
| 6 | Write the any three functions of IoT? | Understand | CO1 | AEC802.3 |
| 7 | What are design factors IoT? | Understand | CO1 | AEC802.3 |
| 8 | What are the interfaces of WSN? | Remember | CO1 | AEC802.3 |
| 9 | Define link layer protocols in IoT. | Remember | CO1 | AEC802.3 |
| 10 | State any four domain specific IoT applications. | Remember | CO1 | AEC802.3 |
| 11 | State about the importance of Thing in IoT. | Understand | CO1 | AEC802.3 |
| 12 | Write the functions of IoT. | Understand | CO1 | AEC802.3 |
| 13 | What are design factors IoT? | Remember | CO1 | AEC802.3 |
| 14 | What are applications of IoT? | Remember | CO1 | AEC802.3 |
| 15 | Explain the IoT communication. | Remember | CO1 | AEC802.3 |

PART – B (LONG ANSWER QUESTIONS)

| | | | | |
|----|---|------------|-----|----------|
| 1 | Discuss the characteristic of IoT. Explain them briefly. | Understand | CO1 | AEC802.1 |
| 2 | What are applications of IoT? Explain in detail. | Remember | CO1 | AEC802.2 |
| 3 | Demonstrate the physical design of IoT with Things of IoT and protocols of IoT. | Remember | CO1 | AEC802.3 |
| 4 | Write the logical design of IoT with communication models. | Understand | CO1 | AEC802.3 |
| 5 | Explain the IoT communication APIs and its importance. | Understand | CO1 | AEC802.3 |
| 6 | Discuss about any three IoT enabling technologies. | Remember | CO1 | AEC802.2 |
| 7 | Illustrate the IoT level 1 with neat diagram. | Understand | CO1 | AEC802.2 |
| 8 | Differentiate the IoT level 2 and level 4 in detailed. | Understand | CO1 | AEC802.2 |
| 9 | Explain the IoT level 3 and level 5 with diagrams. | Understand | CO1 | AEC802.2 |
| 10 | Define the various domain specific of IoT | Understand | CO1 | AEC802.3 |
| 11 | Explain domain specific of IoT with home automation. | Remember | CO1 | AEC802.2 |
| 12 | Explain physical design of IoT in detail. | Understand | CO1 | AEC802.2 |
| 13 | Explain Logical design of IoT in detail. | Understand | CO1 | AEC802.2 |
| 14 | Write the logical design of IoT with communication models? | Remember | CO1 | AEC802.2 |
| 15 | Explain the IoT communication APIs with neat diagrams. | Understand | CO1 | AEC802.2 |
| 16 | Discuss about Trending IoT technologies. | Understand | CO1 | AEC802.2 |
| 17 | Illustrate the IoT level 1 with diagram. | Understand | CO1 | AEC802.2 |
| 18 | Differentiate the IoT level 2, level 3 and level 4 in detailed. | Understand | CO1 | AEC802.3 |

| | | | | |
|----|--|------------|-----|----------|
| 19 | Differentiate logical design and physical design of IoT. | Remember | CO1 | AEC802.2 |
| 20 | Explain domain specific of IoT with home automation example. | Understand | CO1 | AEC802.2 |

PART – C (CRITICAL THINKING QUESTIONS)

| | | | | |
|----|---|------------|-----|----------|
| 1 | Describe with an example of IoT service that uses publish-subscribe and web socket based communication. | Understand | CO1 | AEC802.2 |
| 2 | Determine the IoT levels for designing home automation IoT system including smart lighting and intrusion detection. | Remember | CO1 | AEC802.3 |
| 3 | Determine the various communication models that can be used for weather monitoring system. Which is a more appropriate model for this system. Describe the pros and cons. | Understand | CO1 | AEC802.3 |
| 4 | In Forest fire detection which level of IoT is used? Explain with a neat diagram and its working principle. | Understand | CO1 | AEC802.3 |
| 5 | Determine the IoT levels for designing structural health monitoring. Explain with a neat diagram. | Remember | CO1 | AEC802.2 |
| 6 | What is the role of coordinator in wireless sensor network | Understand | CO1 | AEC802.3 |
| 7 | What are architectural constraints of REST? | Understand | CO1 | AEC802.2 |
| 8 | What is the role of controller service in IoT systems? | Understand | CO1 | AEC802.3 |
| 9 | Describe an example of IoT service with an example of web-based communication model | Understand | CO1 | AEC802.2 |
| 10 | What is the function of communication functional block in an IoT systems? | Remember | CO1 | AEC802.2 |

UNIT-II
IoT AND M2M

PART – A (SHORT ANSWER QUESTIONS)

| | | | | |
|----|---|------------|-----|----------|
| 1 | Write a short note on M2M? | Understand | CO2 | AEC802.4 |
| 2 | Give the purpose of communication protocols used in M2M? | Remember | CO2 | AEC802.4 |
| 3 | State Software Defined Networking? | Remember | CO2 | AEC802.4 |
| 4 | Discuss the purpose of Conventional Networks? | Remember | CO2 | AEC802.4 |
| 5 | List the advantages of SDN? | Understand | CO2 | AEC802.4 |
| 6 | What is Network Function Virtualization? | Understand | CO2 | AEC802.5 |
| 7 | State the differences and similarities between IoT and M2M? | Remember | CO2 | AEC802.5 |
| 8 | How do data collection and analysis approaches differ in M2M and IoT? | Remember | CO2 | AEC802.5 |
| 9 | Differentiate between configuration and state data? | Understand | CO2 | AEC802.4 |
| 10 | What is the function of a data model manager? | Understand | CO2 | AEC802.4 |
| 11 | Explain is M2M gate way? | Understand | CO2 | AEC802.4 |
| 12 | State are communication protocols in IoT | Understand | CO2 | AEC802.4 |
| 13 | State are communication protocols in M2M | Understand | CO2 | AEC802.4 |
| 14 | Write a short note on SDN? | Understand | CO2 | AEC802.4 |
| 15 | Write a short note on M2M? | Understand | CO2 | AEC802.4 |

PART – B (LONG ANSWER QUESTIONS)

| | | | | |
|---|------------------------------------|----------|-----|----------|
| 1 | Differentiate between IoT and M2M. | Remember | CO2 | AEC802.4 |
|---|------------------------------------|----------|-----|----------|

| | | | | |
|----|---|------------|-----|----------|
| 2 | Explain the limitations of conventional network architectures. | Understand | CO2 | AEC802.5 |
| 3 | Discuss about the key elements of SDN | Understand | CO2 | AEC802.4 |
| 4 | Describe how SDN can be used for various levels of IoT. | Remember | CO2 | AEC802.5 |
| 5 | What is the function of a centralized network controller in SDN. | Understand | CO2 | AEC802.6 |
| 6 | Define network function virtualization and explain with neat diagram. | Remember | CO2 | AEC802.6 |
| 7 | Discuss about network function virtualization with example. | Understand | CO2 | AEC802.6 |
| 8 | Describe the IoT system management in detailed. | Remember | CO2 | AEC802.5 |
| 9 | What is the role of IoT NETCONF-YANG management? | Remember | CO2 | AEC802.6 |
| 10 | Discuss about the IoT NETCONF-YANG with components. | Remember | CO2 | AEC802.6 |
| 11 | Differentiate between IoT and M2M. | Remember | CO2 | AEC802.4 |
| 12 | Explain the limitations of conventional network architectures. | Understand | CO2 | AEC802.5 |
| 13 | Discuss SDN architecture in detail | Understand | CO2 | AEC802.4 |
| 14 | Describe how SDN can be used for various levels of IoT. | Remember | CO2 | AEC802.5 |
| 15 | Describe how SDN is used for different IoT levels | Remember | CO2 | AEC802.6 |
| 16 | Describe how NFV is used for virtualization of IoT | Remember | CO2 | AEC802.4 |
| 17 | Difference between SDN and NFV | Understand | CO2 | AEC802.5 |
| 18 | What is the function of centralized network controller in SDN? | Understand | CO2 | AEC802.4 |
| 19 | Which communication protocols are used in M2M local area network? | Remember | CO2 | AEC802.5 |
| 20 | Describe YANG hierarchical structure with data types. | Remember | CO2 | AEC802.6 |

PART – C (CRITICAL THINKING QUESTIONS)

| | | | | |
|---|--|------------|-----|----------|
| 1 | What is the function of centralized network controller in SDN? Differentiate between SDN and NFV? | Understand | CO2 | AEC802.4 |
| 2 | What are the differences between Machines in M2M and things in IoT and communication protocols in M2M and IoT? | Understand | CO2 | AEC802.4 |
| 3 | Why is network wide configuration important for IoT system with multiple nodes? Explain with an illustration. | Understand | CO2 | AEC802.5 |
| 4 | What is NETCONF server explain its significance in IoT system Management with NETCONF- YANG? | Understand | CO2 | AEC802.4 |
| 5 | Describe the roles of YANG and Trans API modules in device management, with a neat sketch. | Understand | CO2 | AEC802.5 |

UNIT-III **IOT ARCHITECTURE AND PYTHON**

PART – A (SHORT ANSWER QUESTIONS)

| | | | | |
|---|---|------------|-----|----------|
| 1 | Define node. | Understand | CO2 | AEC802.7 |
| 2 | What is gateway? | Remember | CO2 | AEC802.7 |
| 3 | State node structure used in IoT. | Understand | CO2 | AEC802.7 |
| 4 | What is state of art? | Remember | CO2 | AEC802.8 |
| 5 | List out various IoT devices used in reference model? | Understand | CO2 | AEC802.8 |
| 6 | Define package? | Remember | CO2 | AEC802.7 |
| 7 | Differentiate procedure oriented programming and object oriented programming? | Understand | CO2 | AEC802.9 |

| | | | | |
|----|---|------------|-----|----------|
| 8 | What is the use of keyword argument in Python? | Understand | CO2 | AEC802.7 |
| 9 | Illustrate the IoT data types and data structures with example? | Remember | CO2 | AEC802.7 |
| 10 | Explain working with lists in Python? | Understand | CO2 | AEC802.8 |
| 11 | Explain control flow in computer networks | Remember | CO2 | AEC802.7 |
| 12 | Illustrate importing of packages from Arduino software | Understand | CO2 | AEC802.8 |
| 13 | List out packages required for humidity sensor | Remember | CO2 | AEC802.7 |

PART – B (LONG ANSWER QUESTIONS)

| | | | | |
|----|---|------------|-----|----------|
| 1 | Explain the architecture reference model IoT. | Remember | CO2 | AEC802.7 |
| 2 | Demonstrate the IoT architecture with diagram and explain. | Understand | CO2 | AEC802.8 |
| 3 | Describe the working of modules in Python. | Understand | CO2 | AEC802.9 |
| 4 | Illustrate the IoT data types and data structures with example. | Remember | CO2 | AEC802.7 |
| 5 | Explain about, i) control flow ii) packages iii) file handling of IoT. | Remember | CO2 | AEC802.7 |
| 6 | What type of Architecture reference model is used for IoT and explain. | Understand | CO2 | AEC802.8 |
| 7 | Discuss about IoT reference model with diagram. | Remember | CO2 | AEC802.8 |
| 8 | What is State of the art introduction of IoT architecture? | Understand | CO2 | AEC802.9 |
| 9 | Explain about various stages of IoT with neat diagram. | Remember | CO2 | AEC802.8 |
| 10 | What is the importance of IoT architecture and explain? | Understand | CO2 | AEC802.8 |

PART – C (CRITICAL THINKING QUESTIONS)

| | | | | |
|---|--|------------|-----|----------|
| 1 | An Architectural Reference Model (ARM) can be visualized as the <i>matrix</i> that eventually derives into a large set of concrete IoT architectures. Justify your answer with neat diagram. | Understand | CO2 | AEC802.8 |
| 2 | In any metamorphic representation IoT ARM can be represented in the form of a tree. Represent it and explain its parts relative to IoT. | Understand | CO2 | AEC802.7 |
| 3 | The foundation of the IoT Reference Model is the IoT Domain Model, which introduces the main concepts of the Internet of Things like Devices, IoT Services and <i>Virtual Entities</i> (VE). Justify your answer with a neat sketch and explain. | Understand | CO2 | AEC802.8 |
| 4 | What is the difference between a Python module and a package? Illustrate with an example. | Understand | CO2 | AEC802.9 |
| 5 | How is function overriding implemented in Python? Explain with an example. | Understand | CO2 | AEC802.8 |
| 6 | Difference between physical and virtual entry | Understand | CO2 | AEC802.9 |
| 7 | What is the purpose of information model? | Understand | CO2 | AEC802.9 |
| 8 | Discuss in detail about IoT reference model with diagram. | Understand | CO2 | AEC802.9 |
| 9 | Discuss State of the art introduction of IoT architecture? | Understand | CO2 | AEC802.9 |

UNIT – IV
IoT PHYSICAL DEVICES AND END POINTS

PART – A (SHORT ANSWER QUESTIONS)

| | | | | |
|---|--|----------|-----|-----------|
| 1 | What are the basic building blocks of an IoT device? | Remember | CO3 | AEC802.10 |
| 2 | List out the Raspberry Pi interfaces? | Remember | CO3 | AEC802.10 |

| | | | | |
|----|--|------------|-----|-----------|
| 3 | Write about Raspberry Pi? | Remember | CO3 | AEC802.10 |
| 4 | Write the purpose of Serial Raspberry Pi interface? | Remember | CO3 | AEC802.11 |
| 5 | Write the purpose of SPI Raspberry Pi interface? | Remember | CO3 | AEC802.11 |
| 6 | Write the purpose of I2C Raspberry Pi interface? | Remember | CO3 | AEC802.12 |
| 7 | What are the various components/peripherals labeled with the Raspberry Pi board? | Understand | CO3 | AEC802.12 |
| 8 | How is Raspberry Pi different from a Desktop computer? | Understand | CO3 | AEC802.12 |
| 9 | What is the use of GPIO pins? | Remember | CO3 | AEC802.12 |
| 10 | What is Cubieboard? | Remember | CO3 | AEC802.12 |
| 11 | Write short note on pcDuino? | Remember | CO3 | AEC802.11 |
| 12 | Discuss about BeagleBone Black. | Remember | CO3 | AEC802.12 |
| 13 | Write about Arduino | Understand | CO3 | AEC802.12 |
| 14 | Write the purpose of Arduino digital pins | Remember | CO3 | AEC802.12 |
| 15 | Write about the purpose of analog pin | Remember | CO3 | AEC802.12 |

PART – B (LONG ANSWER QUESTIONS)

| | | | | |
|----|--|------------|-----|-----------|
| 1 | Discuss various building blocks of IoT with help of neat sketch. | Understand | CO4 | AEC802.12 |
| 2 | What is Raspberry Pi? Explain Raspberry Pi board with various components? | Remember | CO4 | AEC802.10 |
| 3 | Discuss Raspberry Pi GPIO with PINs. | Remember | CO4 | AEC802.12 |
| 4 | Demonstrate Raspberry Pi with interfacing LED. | Understand | CO4 | AEC802.11 |
| 5 | Explain about Raspberry Pi interfaces. | Understand | CO4 | AEC802.11 |
| 6 | Write a Python program for blinking LED with Raspberry Pi? | Remember | CO4 | AEC802.10 |
| 7 | What is the impact of Internet of Things having on Healthcare sector? | Understand | CO4 | AEC802.10 |
| 8 | What are the different sectors where the Internet of Things can actually add value to the current processes? | Understand | CO4 | AEC802.11 |
| 9 | Explain why energy consumption will be an issue when the Internet of Things is implemented? | Understand | CO4 | AEC802.12 |
| 10 | What are the main challenges of the Internet of Things implementation? | Remember | CO4 | AEC802.11 |
| 11 | Discuss various building blocks of IoT with help of neat sketch. | Understand | CO4 | AEC802.10 |
| 12 | Discuss the steps to download Arduino software | Remember | CO4 | AEC802.12 |
| 13 | Illustrate an LED with Arduino | Understand | CO4 | AEC802.11 |

PART – C (CRITICAL THINKING QUESTIONS)

| | | | | |
|---|--|------------|-----|-----------|
| 1 | How Raspberry Pi different from a desktop computer? Justify your answer with an illustration. | Understand | CO4 | AEC802.10 |
| 2 | Write a Python program for controlling an LED with a switch. | Understand | CO4 | AEC802.11 |
| 3 | Write a Python program for sending an email on switch press. | Understand | CO4 | AEC802.12 |
| 4 | Write a Python program for switching LED/Light based on reading LDR reading. | Understand | CO4 | AEC802.12 |
| 5 | Which are alternatives to Raspberry Pi? Explain with neat diagrams. | Understand | CO4 | AEC802.10 |

| UNIT-V IoT PHYSICAL SERVERS AND CLOUD OFFERINGS | | | | |
|--|--|------------|-----|-----------|
| PART – A (SHORT ANSWER QUESTIONS) | | | | |
| 1 | What is Arduino? | Remember | CO4 | AEC802.14 |
| 2 | Write short note on web application messaging protocol? | Understand | CO4 | AEC802.14 |
| 3 | Discuss the importance of XML in IoT? | Understand | CO4 | AEC802.13 |
| 4 | Define Virtual workspaces? | Remember | CO4 | AEC802.15 |
| 5 | List out the cloud storage models? | Understand | CO4 | AEC802.13 |
| 6 | What is Xively cloud service? | Understand | CO4 | AEC802.15 |
| 7 | What is Boto? | Remember | CO4 | AEC802.15 |
| 8 | What is Autobahn for IoT? | Understand | CO4 | AEC802.15 |
| 9 | What are the features of Autobahn? | Understand | CO4 | AEC802.15 |
| 10 | Write a short note on about Scikit-learn package? | Remember | CO4 | AEC802.14 |
| PART – B (LONG ANSWER QUESTIONS) | | | | |
| 1 | Define WAMP protocol and explain WAMP concept. | Remember | CO4 | AEC802.14 |
| 2 | With an example discuss about IoT application with Amazon Auto Scaling by using Python code. | Understand | CO4 | AEC802.14 |
| 3 | Explain about IoT cloud with home automation. | Understand | CO4 | AEC802.13 |
| 4 | Discuss about the analysis of IoT with smart environment. | Remember | CO4 | AEC802.15 |
| 5 | Explain about Xively Cloud for IoT. | Understand | CO4 | AEC802.13 |
| 6 | What are the risks and challenges that we should be aware of when it comes to the Internet of Everything? | Understand | CO4 | AEC802.15 |
| 7 | Explain the concept of Home Automation using IoT. | Remember | CO4 | AEC802.15 |
| 8 | What are the impacts that can be observed in implementing internet of Things on Agriculture sector? | Understand | CO4 | AEC802.15 |
| 9 | What Impacts will the Internet Of Things have on infrastructure and smart cities sector? | Understand | CO4 | AEC802.15 |
| 10 | Compare the contrast the difference between Wireless Sensor Network (WSN) and Internet Of Things (IoT)? | Remember | CO4 | AEC802.14 |
| PART – C (CRITICAL THINKING QUESTIONS) | | | | |
| 1 | What does a Map Reduce job comprise of? Explain with an example. | Understand | CO4 | AEC802.13 |
| 2 | What are the uses of message queues? What are the message formats supported by Amazon SQS? Explain. | Understand | CO4 | AEC802.15 |
| 3 | What is Amazon Dynamo DB? Describe an application that can benefit from Amazon Dynamo DB. | Understand | CO4 | AEC802.14 |
| 4 | Extend the functionality of the home intrusion detection IoT system by interfacing a webcam. Implement a function in the controller to capture an image from the webcam and send it as an attachment in the email alert when an intrusion is detected. | Understand | CO4 | AEC802.15 |
| 5 | Implement the air pollution monitoring system using the web Socket approach. | Understand | CO4 | AEC802.13 |

Prepared by:

Mr. T Vinay Simha Reddy, Assistant Professor

HOD, ECE