Internal Assessment Test 1 Scheme & Solution – May 2022

Sub:	Internet of Things					Sub Code:	18CS81	Branch:	ISE
Date:	14/05/22	Duration:	90 mins	Max Marks:	50	Version/ Sem / Sec:	C/VIII/A,B,C		OBE

		MARKS	CO	RBT
1.	Explain with neat diagram one M2M IoT standardized architecture.	[10]	CO1	L2

- It was created with a goal of accelerating Machine to machine applications & devices.
- It expanded to include IoT.
- One M2M was launched with a goal to promote efficient M2M communication systems and IoT.
- OneM2M Goal: create a common services layer.
- Its framework focuses on IoT services , applications, and platforms.
- It divides IoT functions into 3 major domains.
- It supports wide range of IoT technologies.

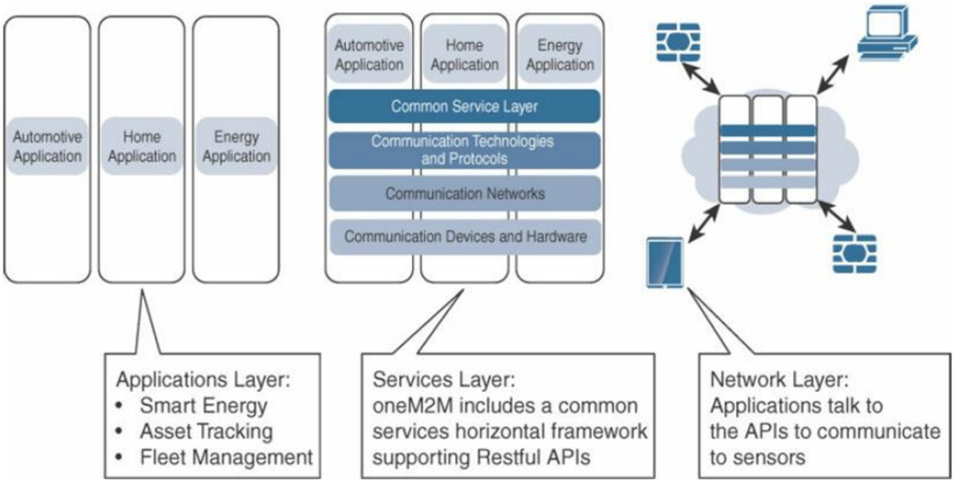

Figure 2-1 The Main Elements of the oneM2M IoT Architecture

2.	What is Zigbee? Explain 802.15.4 physical layer, MAC layer and security.	[10]	CO2	L2

- ZigBee is one of the most well-known protocols.
- ZigBee utilizes the IEEE 802.15.4 standard at the lower PHY and MAC layers

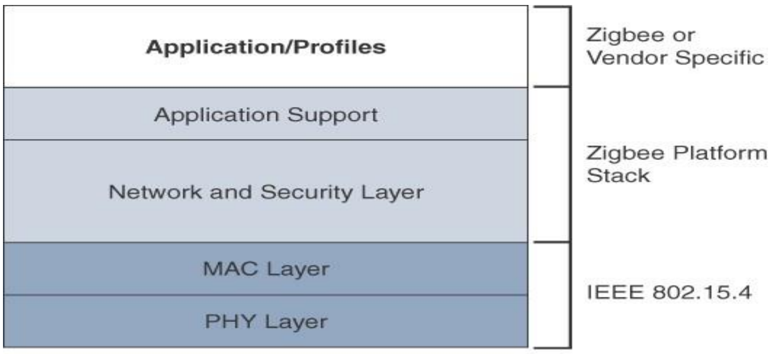

Figure 4-3 *High-Level ZigBee Protocol Stack*

- ZigBee specifies the network and security layer and application support layer that sit on top of the lower layers.

- ZigBee predefines many application profiles. Home Automation and Smart Energy are two examples of popular application profiles of Zigbee.

ZigBee network and security layer:

- Provides mechanisms for network startup, configuration, routing (calculating routing paths, managing routing tables, discovering neighbors), and securing communications.
- The network layer is also responsible for forming the appropriate topology.
- ZigBee utilizes 802.15.4 for security at the MAC layer, using the Advanced Encryption Standard (AES) with a 128-bit key.
- Finally, but this structure has not provided interoperability with other IoT solutions

3. Explain IoT reference model published by IoTWF. [10] CO1 L3

Layer 1: Physical Devices and Controllers Layer

- This layer is home to the “things” in the Internet of Things, including the various endpoint devices and sensors that send and receive information.
- The primary function is generating data

Layer 2: Connectivity Layer

- The primary function of this IoT layer is the reliable and timely transmission of data.

Layer 3: Edge Computing Layer

- Here emphasis is on data reduction and converting information that is ready for storage and processing by higher layers.

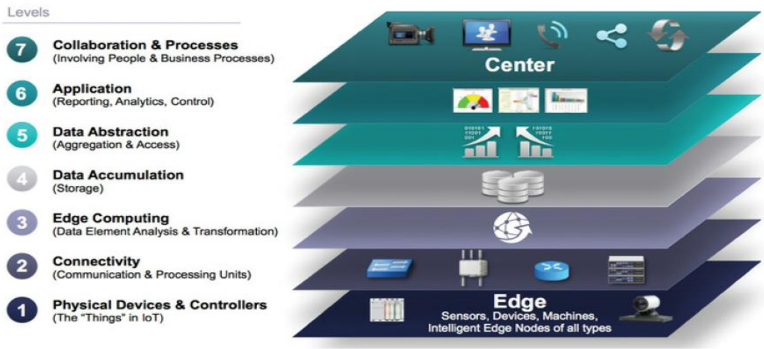

Figure 2-2 IoT Reference Model Published by the IoT World Forum

IoT Reference Model Layer	Functions
Layer 4: Data accumulation layer	Captures data and stores it so it is usable by applications when necessary. Converts event-based data to query-based processing.
Layer 5: Data abstraction layer	Reconciles multiple data formats and ensures consistent semantics from various sources. Confirms that the data set is complete and consolidates data into one place or multiple data stores using virtualization.
Layer 6: Applications layer	Interprets data using software applications. Applications may monitor, control, and provide reports based on the analysis of the data.
Layer 7: Collaboration and processes layer	Consumes and shares the application information. Collaborating on and communicating IoT information often requires multiple steps, and it is what makes IoT useful. This layer can change business processes and delivers the benefits of IoT.

Table 2-2 *Summary of Layers 4–7 of the IoTWF Reference Model*

4 (a) What does IoT and digitization mean? Summarize. [06] CO1 L2

IoT:

- The basic premise and goal of IoT is to "connect the unconnected."
- The world of IoT is broad and multifaceted.
- IoT is good to view it as an umbrella of various concepts, protocols, and technologies

Digitization:

- Conversion of information into a digital format. Ex- photography & transportation industry
- Digitization brings together things, data, and business process to make networked connections more relevant and valuable. Ex- Home automation (NEST)
- Companies today look at digitization as a differentiator for their businesses, and IoT is a prime enabler of digitization.

(b) Identify the evolutionary phases of the internet. [04] CO1 L3

- The age of IoT is often said to have started between the years 2008 and 2009.

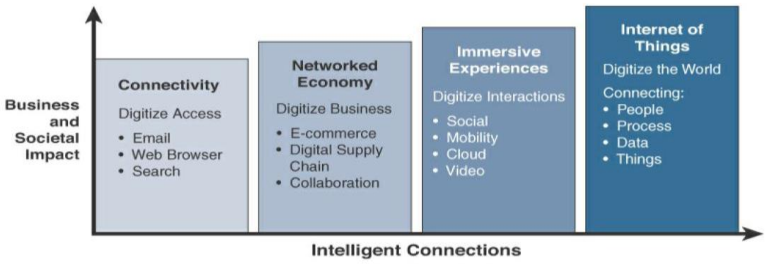

Figure 1-1 Evolutionary Phases of the Internet

5 (a) Outline different challenges in IoT? [06] CO1 L2

- Scale
- Security
- Privacy
- Big data & Data Analytics
- Interoperability

(b) Explain WSN. [04] CO2 L2

Wireless sensor networks are made up of wirelessly connected smart objects, which are sometimes referred to as motes.

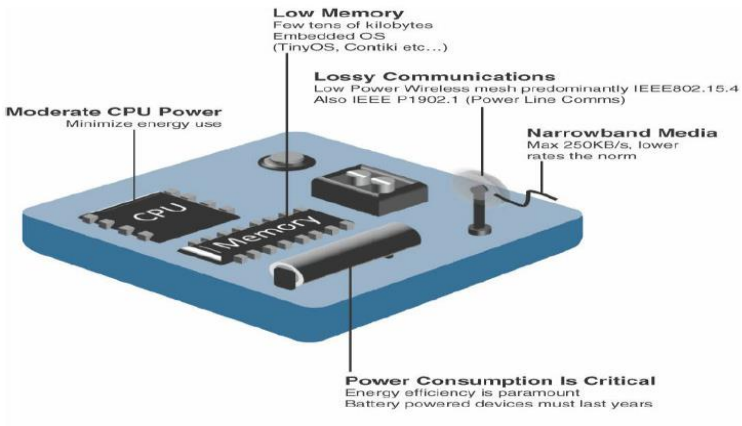

Figure 3-8 Design Constraints for Wireless Smart Objects

- The following are some of the most significant limitations of the smart objects in WSNs:
  - ✓ Limited processing power

- ✓ Limited memory
- ✓ Lossy communication
- ✓ Limited transmission speeds
- ✓ Limited power

- These limitations greatly influence how WSN's are designed.

6 (a) Examine the characteristics and attributes concerned when selecting and dealing with connecting smart objects. [02] CO2 L4

- A smart object, is described as a device that has, the following four defining characteristics:

1. Processing unit
2. Sensor(s) and/or actuator(s)
3. Communication device
4. Power source

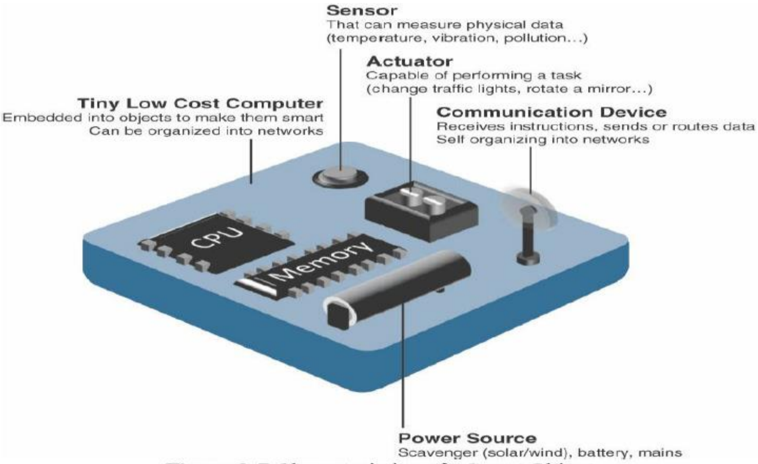

Figure 3-7 Characteristics of a Smart Object

(b) Identify different types of sensors. [08] CO2 L3

Table 3-1 *Sensor Types*

Sensor Types	Description	Examples
Position	A position sensor measures the position of an object; the position measurement can be either in absolute terms (absolute position sensor) or in relative terms (displacement sensor). Position sensors can be linear, angular, or multi-axis.	Potentiometer, inclinometer, proximity sensor
Occupancy and motion	Occupancy sensors detect the presence of people and animals in a surveillance area, while motion sensors detect movement of people and objects. The difference between the two is that occupancy sensors generate a signal even when a person is stationary, whereas motion sensors do not.	Electric eye, radar
Velocity and acceleration	Velocity (speed of motion) sensors may be linear or angular, indicating how fast an object moves along a straight line or how fast it rotates. Acceleration sensors measure changes in velocity.	Accelerometer, gyroscope
Force	Force sensors detect whether a physical force is applied and whether the magnitude of force is beyond a threshold.	Force gauge, viscometer, tactile sensor (touch sensor)
Pressure	Pressure sensors are related to force sensors, measuring force applied by liquids or gases. Pressure is measured in terms of force per unit area.	Barometer, Bourdon gauge, piezometer
Flow	Flow sensors detect the rate of fluid flow. They measure the volume (mass flow) or rate (flow velocity) of fluid that has passed through a system in a given period of time.	Anemometer, mass flow sensor, water meter

Sensor Types	Description	Examples
Acoustic	Acoustic sensors measure sound levels and convert that information into digital or analog data signals.	Microphone, geophone, hydrophone
Humidity	Humidity sensors detect humidity (amount of water vapor) in the air or a mass. Humidity levels can be measured in various ways: absolute humidity, relative humidity, mass ratio, and so on.	Hygrometer, humistor, soil moisture sensor
Light	Light sensors detect the presence of light (visible or invisible).	Infrared sensor, photodetector, flame detector
Radiation	Radiation sensors detect radiation in the environment. Radiation can be sensed by scintillating or ionization detection.	Geiger-Müller counter, scintillator, neutron detector
Temperature	Temperature sensors measure the amount of heat or cold that is present in a system. They can be broadly of two types: contact and non-contact. Contact temperature sensors need to be in physical contact with the object being sensed. Non-contact sensors do not need physical contact, as they measure temperature through convection and radiation.	Thermometer, calorimeter, temperature gauge
Chemical	Chemical sensors measure the concentration of chemicals in a system. When subjected to a mix of chemicals, chemical sensors are typically selective for a target type of chemical (for example, a CO_2 sensor senses only carbon dioxide).	Breathalyzer, olfactometer, smoke detector
Biosensors	Biosensors detect various biological elements, such as organisms, tissues, cells, enzymes, antibodies, and nucleic acid.	Blood glucose biosensor, pulse oximetry, electrocardiograph