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**Presidency University**

**Bengaluru**

 **SCHOOL OF ENGINEERING**

**MAKE-UP EXAMINATION – SEP 2023**

**Course Code**: ECE 297

**Course Name**: INTERNET OF THINGS

**Program** : B.Tech

**Date**: 30-SEP-2023

**Time**: 1.00PM to 4.00 PM

**Max Marks**: 100

**Weightage**: 50%

 **Instructions:**

*Read all questions carefully and answer accordingly.*

**Part A [Memory Recall Questions]**

**Answer all the Questions. Each question carries 2 marks. (15Qx 2M= 30M)**

Q.NO.1. A System on a Chip (SoC), is a single integrated chip (IC). List the major components present in it. [2] (C.O.No.2) [Knowledge level]

Q.NO.2. Prototype of IoT application is the need before final testing and many steps are used to design the prototype. What is the right sequence in prototyping a hardware module? A. Simulate B. Test C. Deploy D. Build [2] (C.O.No.2) [Knowledge level]

Q.NO.3. A standard interface for connecting a single-board computer or microprocessor to other devices is through General-Purpose Input/ Output (GPIO) pins. How many pins are used as digital input pins in Arduino? [2] (C.O.No.2) [Knowledge level]

Q.NO.4. LoRa network uses a star topology in which an end node can send messages to multiple gateways that communicate with the network server. Draw the LoRA network Architecture? [2] (C.O.No.2) [Knowledge level]

Q.NO.5. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. Mention the two functions present in IDE. [2] (C.O.No.2) [Knowledge level]

Q.NO.6. To write a code we need to plug Arduino with the help of a USB Cable and then we need to identify the port at which the board is visible. Write the interfacing steps required to do the job.

 [2] (C.O.No.2) [Knowledge level]

Q.NO.7. Prototyping the IoT devices is a costly affair hence many development boards are used. For this purpose, suggest 2 commonly used development boards. [2] (C.O.No.2) [Knowledge level]

Q.NO.8. Various IoT development Boards are available in the market such as ARM Processors and Controllers. What are the crucial points based on which we will make a decision to choose the correct board? [2] (C.O.No.3) [Knowledge level]

Q.NO.9. Wearable technologies, known mostly just as “wearables,” these are electronic devices that are physically worn by individuals in order to track, analyze and transmit personal data. List the architectural elements of Wearable IoT. [2] (C.O.No.3) [Knowledge level]

Q.NO.10. Near Field Communication (NFC) technology allows users to make secure transactions, exchange digital content, and connect electronic devices with a touch. Mention the two modes of communication in it. [2] (C.O.No.3) [Knowledge level]

Q.NO.11. In RFID, the data can be read from a distance with no contact or even line of sight necessary. List the components of RFID. [2] (C.O.No.3) [Knowledge level]

Q.NO.12. Cloud computing refers to storing and accessing the data and programs on remote servers that are hosted on the internet instead of the computer’s hard drive or local server. Mention the three of the main branches of cloud computing. [2] (C.O.No.3) [Knowledge level]

Q.NO.13. Wearable Computer is a small portable computer that is designed to be worn on the body during use. List a few wearable device properties. [2] (C.O.No.3) [Knowledge level]

Q.NO.14 The LAN, WAN, PAN are type of network which connects objects with each other. The----------- is the network of interconnected heterogeneous objects such as smart devices, smart objects, sensors, actuators, embedded computers, etc. uniquely addressable and based on standard communication protocols. [2] (C.O.No.1) [Knowledge level]

Q.NO.15 A sensor node is a type of transducer that uses one type of energy, a signal of some sort, and converts it into a readable value for the purpose of information transfer. Mention the components of sensor nodes. [2] (C.O.No.1) [Knowledge level]

**Part B [Thought Provoking Questions]**

**Answer all the Questions. Each question carries 10 marks. (3Qx10M=30 M)**

Q.NO.16 IoT application deals with large amount of data at the edge level, the final product expects the exact and precise visualization of the data by end user. Explain how the problem of this data handing is dealt in IoT application. What are various domains and methods used for converting the data into exact information. Explain with an example? (C.O.No.2) [Comprehension level]

Q.NO17. Cloud is a utility which has helped the organization to reduce or eliminate their reliance on on-premises server, storage, and networking infrastructure. (C.O.No 2) [Comprehension level]

1. What are the cloud components?
2. What are the benefits of cloud architecture?
3. Describe three models presently used in IoT cloud?
4. How cloud Architecture Works?

Q.NO.18 The Bruhat Bengaluru Mahanagara Palike (BBMP) has a plan to install NB-IoT enabled Smart Parking and Lighting System in Bangalore due to limited parking spaces in certain key areas. The NarrowBand-Internet of Things (NB-IoT) is a standards-based low power wide area (LPWA) technology developed to enable a wide range of new IoT devices and services. Some of the important features of NB-IoT: improves the power consumption of user devices, battery life of more than 10 years can be supported, can co-exist with 2G, 3G, and 4G mobile networks, all the security and privacy features of mobile networks supported such as user identity confidentiality, entity authentication, confidentiality, data integrity, and mobile equipment identification.

BBMP will install sensors embedded into the street under the parking spaces which can sense when a space is free or empty by the presence of a vehicle above them. This status is then communicated through a Network Operator’s NB-IoT radio access network which is linked to a Telecom network. The parking data are then collected by a local partner of the Network Operator (in turn connected to cloud), who provide a parking app that residents can use to view where there are parking spaces available. The app is then able to guide the driver direct to the available parking spot.

Your task is to map the activities of all the processes for this system, that will be taken care at all the levels of The IoT World Forum (IoTWF) Standardized Architecture. You can present your solution using a table by showing the activities and applicable resources.

 **Part C [Problem Solving Questions]**

**Answer both the Questions. Each question carries 8 marks. (2Qx20M=40M)**

Q.NO.19 Consider the scenario of a Smart Office Building situated in Delhi. On a humid evening after the normal working hours (6 PM), when all employees had left the office, the Manager gets a call (at 7.30PM IST) from an international collaborator in USA, that he needs to meet at least the manager himself and three of his subordinates in the boardroom of the office in Delhi. The manager informs immediately all three subordinates that they should reach before 8PM (all including the manger leave in nearby areas). Considering the smart connected building concepts, identify and list out at least four important activities that will be performed by various smart sensors and actuators till the meeting gets over in 2 hrs. (Please write you answer in minimum four bulleted points)

 (C.O.No.3) [Comprehension level]

Q.NO.20 You have been asked to design an assisting device (sensors and actuators fitted in a wheel chair) for persons suffering with paralysis with movement impairments. Among the 7 design principles of IoT, discussed in lectures: Focus on value, Take a holistic view, Put safety first, Consider the context, Build a strong brand, Prototype early and often, Use data responsibly. Which of the important four characteristics will influence your design and why? Justify your answer by citing the sensors and actuators used in your design. (C.O.No.3) [Application Level]