SRM Institute of Science and Technology

College of Engineering and Technology

School of Computing

DEPARTMENT OF NETWORKING AND COMMUNICATIONS

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

Academic Year: 2022-2023

**Test: CLAT-3 Date: 5.05.2023**

**Course Code & Title: 18CSE448T: Energy Management for IoT devices**

**Duration: 2 Periods**

**Year & Sem: III & VI Max. Marks: 50 Marks**

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|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | *H* | *M* | *M* | *M* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | - | *-* | *-* | *-* |
| C02 | *H* | *M* | *M* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | - | *-* | *-* | *-* |
| CO3 | *H* | *H* | *H* | *H* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | - | *-* | *-* | *-* |
| CO4 | *H* | *M* | *H* | *H* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | M | *-* | *-* | *-* |
| CO5 | *H* | *H* | *H* | *H* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | M | *-* | *-* | *-* |
| CO6 | *H* | *M* | *M* | *M* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |

3-High, 2- Medium, 1-low

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| **Part - A**  **(10 x 1 = 10 Marks) Instructions: Answer all** | | | | | | | | | | | |
| Question | | Marks | | BL | | CO | PO | | | PI Code | |
| 1. In smart metering \_\_\_\_\_\_\_\_ network, connects multiple homes through a single data aggregator unit 2. **Neighborhood area network** 3. Home area network 4. Wide area network 5. Duty Cycling | | 1 | | 1 | | 2 | 1 | | | 1.6.1 | |
| 1. The \_\_\_\_\_\_\_\_\_\_ framework is used to enhance sensor cloud network by the addition of the cloud services 2. **Sensory data processing framework** 3. Sensory network framework 4. Cloud data processing framework 5. Data processing framework | | 1 | | 1 | | 2 | 1 | | | 1.3.1 | |
| 1. Which of the following device is used to measure the gas or liquid? 2. Optical sensors 3. Gas sensors 4. Smoke Sensor 5. **Pressure Sensor** | | 1 | | 1 | | 2 | 1 | | | 1.6.1 | |
| 1. \_\_\_\_\_\_\_\_\_ is a rapidly growing field that combines the power of IoT technology with sustainable and environmentally friendly practices 2. IIoT 3. **Green IoT** 4. Machine-to-machine Communication 5. Genetic Algorithm | | 1 | | 1 | | 2 | 1 | | | 1.6.1 | |
| 1. Which of the following techniques are leading to the implementation of green IoT 2. Smart Metering 3. **Smart Sensors and smart Metering** 4. Smart Sensors and electric devices 5. smart Metering and electric devices | | 1 | | 1 | | 2 | 1 | | | 1.3.1 | |
| 1. \_\_\_\_\_\_\_\_\_\_\_\_ have advantage of easy installation and maintenance though, often needing higher operational cost 2. **Non-intrusive transducers** 3. Intrusive transducers 4. Non-intrusive Sensors 5. Intrusive sensors | | 1 | | 1 | | 3 | 1 | | | 2.6.4 | |
| 1. Why synchronization between various uplink and down link messages slots for different messages in the transmission queue to important? 2. Temporary buffer centralization 3. **To avoid disruption in transmission** 4. To introduce disruption in transmission 5. Temporary buffer de-centralization | | 1 | | 1 | | 3 | 1 | | | 2.6.4 | |
| 1. The frequency time division for bandwidth allocation for physical transmission channel known as\_\_\_\_\_\_\_\_\_\_\_\_. 2. **Physical random access channel(PRACH)** 3. Evolved node-B(eNB) 4. Orthogonal frequency division multiple access(OFDMA) 5. Single carrier frequency division multiple access(SC-FDMA) | | 1 | | 1 | | 3 | 1 | | | 1.7.1 | |
| 1. Which of the following technique provides a trust-based secure communication platform, allows exchange of information in a secure way   a) **Cooperative automated vehicle**  b) Internet of vehicle  c) Intra-vehicle network  d) Automated Vehicle | | 1 | | 1 | | 3 | 1 | | | 1.7.1 | |
| 10. In ITS technology strata, \_\_\_\_\_\_ layer fills the gap between sensing technology, activation process and the computational and information processing levels.  a**) Communication Layer**  b) Perceptron Layer  c) Transport Layer  d) Network Layer | | 1 | | 1 | | 3 | 1 | | | 2.6.4 | |
| **Part – B**  **(5 x 2 = 10 Marks) Instructions: Answer any 5** | | | | | | | | | | |
| 1. | Write about the different approaches for achieving Green IoT   * categorizes these methodologies as software-based methodologies, hardware-based methodologies, policy-based methodologies, awareness-based methodologies, etc | 2 | 1 | | 1 | | | 1 | 1.6.1 | |
| 2. | What are the benefits of energy-efficient smart health care system?   * An efficient monitoring and diagnosis can be performed by IoT-enabled healthcare devices. * The data collected from the sensors will provide doctors a very clear idea about the nature of diseases and lead them to accurate diagnosis. * Through these efficient IoT devices, a doctor can monitor his patient even remotely. * Similarly, by utilizing the readings from the IoT sensors, we can regulate the energy usage in a hospital environment. * By effectively combining the insights from the IoT sensors, we can have an efficient energy usage pattern in a hospital, so as to minimize energy wastage and leap toward energy efficiency | 2 | 2 | | 1 | | | 1 | 2.6.4 | |
| 3. | Discuss promoting the Usage of Sensor Cloud.   * Sensor clouds combine the capabilities of wireless sensor networks and cloud computing * Promoting the use of sensor cloud network will be a good step toward promoting green IoT. * Sensor cloud models involve ubiquitous sensors which collect information from surroundings and these data will be stored in the cloud infrastructure provided by cloud service providers. | 2 | 2 | | 2 | | | 2 | 1.6.1 | |
| 4. | Discuss the Bluetooth low energy(BLE) importance in IoT  It is essential for IoT networks due to their ability to **conserve battery power on devices**. Major use cases of BLE and Bluetooth technology include: Mobile payments for friction-less checkout at retail outlets Charging multiple devices by transferring energy up to 5 centimeters Smart Tags at airports to keep track of traveler luggage and belongings | 2 | 1 | | 2 | | | 2 | 2.6.4 | |
| 5. | How duty cycling could be done for energy optimization?   * Synchronization between various uplink and downlink message slots for different messages in the transmission queue is important to avoid disruption in transmission and intermixing, leading to a corrupted communication. * we use frequency time division for bandwidth allocation for physical transmission channel known as physical random access channel (PRACH) here. * This allows us to establish a radio resource control (RRC) that ultimately serves the goal of bandwidth division. * Connected nodes in this network are informed of availability of PRACH resources through a broadcast or other downlink channels by the evolved node-B (eNB) | 2 | 2 | | 3 | | | 2 | 2.6.4 | |
| 6. | List out the motivations for IoT in Transportation   * Minimization of energy consumption and vehicular emission is the major challenge for sustainable development as well as for healthy life. * ITS provides a gateway for efficient fuel usage, road navigation, travel support, route perception as well as environment awareness that shall ultimately minimize the risk of or culminate the causal factors to the above-discussed problems perceived in transportation | 2 | 3 | | 3 | | | 2 | 1.7.1 | |

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| Part – C (2 x 15 = 30 Marks) | | | | | | |
| 1. | If I wanted to create awareness of their energy usage and current energy need to the users, what are the techniques are the best suitable one.   * Creating Awareness Through Prototyping: A Green IoT-Based Smart Home Model * Monitoring Energy Consumption * A Robust Information Management and Automation System * User Feedback and User Involvement for Energy Savings | 15 | 2 | 2 | 2 | 2.6.4 |
|  | (OR) |  |  |  |  |  |
| 2. | Describe in detail about the Green IoT and its techniques   * Green IoT comprises methods for reducing energy consumption and how sensors can be efficiently used as an indication of energy conservation      * As shown in the picture, smart sensors and usage of smart metering are leading to the implementation of green IoT * Implementation of effective energy usage policy and energy awareness campaigns are also leading to the concept of green IoT * Green IoT also includes the concept of how IoT can be utilized to reduce energy consumption. * Using the IoT sensors, electric devices can be disconnected from power supply or convert into power saving mode if being unused | 15 | 2 | 2 | 1 | 1.6.1 |
| 3. | Explain about the intelligent transport systems   * ITS may be considered as a holistic transportation management and service system which aims to provide innovative and user-friendly services relating to different modes of transport * ITS uses a network of IoT sensors as the underlying basis for these innovative solutions to transport management. These sensors help in capturing data in a real time and feed the data to various networked subsystems of communication channels and data processors. * ITS through the implementation of its subsystems, collects relevant data, processes it, and hands out the solutions to problems and concerns at hand in various aspects that might be encountered during travel, ranging from road safety, congestion management, traffic rules implementation, to catering to ever-evolving needs of passengers * Apart from segmental energy optimization, power harnessing at macro-level may be planned to achieve energy efficiency of the ITS systems. * Like any other systems, ITS also has some operational issues which need to be addressed to make it highly productive and efficient. * Some typical issues associated with communication process like congestion, clashes, and resource allocation may be resolved by employing various methods like use of routing algorithms with optimized duty cycle and latency determination, resource time scheduling, unsynchronized intelligent learning based resource management, etc. | 15 | 2 | 3 | 1 | 2.6.4 |
|  | (OR) |  |  |  |  |  |
| 4. | Describe the motivation for vehicle to everything (V2X) and V2G technology.   * Vehicle to everything is a partnership project using 4G LTE, C-V2X, or 5G network to support communication between vehicles to infrastructure (V2I), vehicle to network (V2N), vehicle to vehicle (V2V), vehicle to pedestrian (V2P), vehicle to device (V2D), and vehicle to grid * The cellular V2X (C-V2X) demands improved infrastructure capable of delivering economic and societal impact in terms of safe driving experience, reduced accidents, predictive travel, less greenhouse gas emission, and better traffic efficiency * It enables a growing set of applications such as forward collision warning, do not overtake, blind intersection at crossroads, queue warning, curve speed warning, road user alerts, discover parking and charging, optimal speed for traffic signal priority, emergency vehicle alert, etc.. * The communication may be within the device to device (direct) for out of coverage area or via a network within coverage area * The gap between demand and supply may be filled with the ancillary services (reserves). Frequency regulation is the process of maintaining the system frequency to its predetermined value either by injecting a little power or by withdrawing power from the grid. * The power flow from vehicle to grid (V2G) may provide better frequency regulation as it is believed that at any instance, more than 90% of vehicles are parked. A vehicle battery can be viewed as a source of energy in between 10 and 30 kWh depending upon the size of the vehicle. * To exploit the potential of plug-in-electric vehicle (PEV), it needs to be connected to grid to supplement the generation. * This may relieve the utility from excess generation during peak hours and benefit the consumer in terms of reduced electricity charges due to saving in transmission cost. | 15 | 4 | 3 | 2 | 1.7.1 |

Approved by the Audit Professor/Course Coordinator