THE TECHNOCRACY
STUDENTS' TECHNICAL COMMITTEE, NIT RAIPUR

AAVARTAN'22-23

VIGYAAN
DEPARTMENT OF ELECTRICAL ENGINEERING

PROBLEM STATEMENTS

EE01. Control and Simulation of Brushless DC Motor Driver for EV

Electric vehicles have taken the lime light in this century. It has been the greatest discovery of the era. BLDC Motors are used in such electric vehicles. The problem proposed here is to control (test) and simulate BLDC motor driver for EV. The BLDC motor drive is suitable for electric vehicle to operate in a **wide speed range** and frequent load changing condition. Driver circuit using BLDC motor of suitable rating is to be implemented. Emphasis should be given on simulation of speed-control too.

EE02. LPG Leakage Detection and its Solution

LPG leakage is fatal for the safety of household. The main objective of the circuit is to detect LPG leakage and to provide **an automation or regulation to prevent the leakage**.. The project should include an integrated circuit with necessary components to achieve the goal.

EE03. Smart-Water Management System using IoT Devices

Water management is very crucial today to prevent wastage of water during agricultural, household and manufacturing processes.The basic idea behind this problem statement is to alert the user by an sms when the water overflows the tank and some automation to be undertaken to block the water-flow.

EE04. Intruder Detection System using IoT Devices

Target is to alert the user when any burglar enters the house and as a defensive measure, the IoT device should electrify the house as well.

EE05. Efficient energy storage techniques

Electricity can be easily generated, transported and transformed. However, to store it in a practical, easy and cost-effective way is the biggest challenge.
As you know, efficient energy storage systems are must for making the most out of our intermittent renewable energy generation.Innovative ideas are welcomed for safe energy storage devices suitable for Indian terrain. The basic idea is to store certain amount of energy (say 1kW) efficiently over an appreciable duration.

EE06. Wireless charging of EV using two rectifiers

Usually, electric vehicle systems are based on various modules that should ensure the high power and stability of the vehicle on the track. The majority of these components are linked to the charging mechanism. Here electric vehicles with wireless charging system is to be designed using two rectifiers. Prototype of fuel charging station for an electric car and adaptive charging based on time of use tariff is to be presented.
Participants will be judged on the basis of the charging-time and output mileage of the models put forth.

EE07. Design of robust and effective SMPS for charging of Li battery used in EV

The use of SMPS based battery charger for charging of Lithium-Ion batteries used in Electric vehicles is to be designed. The various protections in the circuit should also be considered. In order to charge the batteries efficiently, and to ensure their long life, we need a correct battery charging system. This charging system can support both Lithium Ion and Lead acid battery. Several topologies such as LLC resonant converter, fly back and forward converter are possible. A Forward converter topology will be preferred. It uses a single switch (MOSFET) and has relay drive logic at the output with protection from reverse charging of batteries. It regulates the output voltage through feedback. The proposed problem is to simulate the proposed SMPS based charger that offers better Power quality and reliability. A prototype will be required to validate the feasibility and benefits of the system.

EE08. Power factor improvement using IoT

Energy efficiency has become more than a cost issue today. Using energy efficiently leads to greater savings in resources and safety of the environment for future. Increasing efficiency has significant impact on energy savings. A small saving at load level can create a major savings of resources at the power plant. The inductive loads like motors, welding, furnaces, ballasts and compressors needs reactive power(KVAR) to operate. The consumption of reactive power from the grid is possible by the increased consumption of apparent power(KVA) and increase in load current which in turn increase the losses. The power factor is an indication of how well the electricity is efficiently used. The utilities are charging for the inefficient usage and adding incentives for the efficient usage. So, there comes the need for the Power factor correction devices to improve overall electrical efficiency of the power

system. As the load variations are unpredictable the Power factor correction has to be automated based on the load level. The proposed problem is design an APFC (Automatic Power Factor Correction) at the load end embedded with the communication devices and sensors for the assurance of better power quality and reduced electricity consumption and ultimately, reduction in electricity bills. The objective of the project is to design a zero human intervention energy surveillance in order to achieve the unity power factor strategy using the IoT.

EE09. Soil fertility determination using electric sensors

Measurement of soil content N (nitrogen), P (phosphorus), and K (potassium) is necessary to determine how much additional nutrient content is to be added to soil to increase crop fertility. The problem proposed is to effectively and reliably measure soil nutrient content using electric sensor and Arduino.

EE10. Energy Management System in ev

In every EV, there is an EM System installed that regulates flow of energy to the required load like TV, fan, light,windows, front motors, rear motors, etc. of an Electric Vehicle.This problem statement requires participants to show a model of effective energy management system in Electric vehicles.

EE11. Water quality detection using IoT

Water is measured for its TDS, i.e., Total Dissolved Solids. Because of dissolved solids, water become conductive and there is a term called Electrical Conductivity. There is a maximum value of electrical conductivity (400uS/cm) above which water becomes unfit for drinking. Here the given task is to determine quality of water using IoT.