Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

II SEMESTER M.TECH (PED & EVT)

END SEMESTER EXAMINATIONS, APRIL- MAY 2024

EV GRID INTEGRATION [ELE 5409]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 09 May 2024** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A.	Classify and explain the key aspects of V2G in power markets with suitable applications.	***(03)***
1B.	Identify and discuss the different technical challenges to V2G.	***(03)***
1C.	Solve and explain the stochastic load modeling of EV with respect to initial state of charge (SOC) and EVs load profile.	***(04)***
2A.	Identify and explain the influence of EVs on urban microclimate with a suitable example.	***(05)***
2B.	Describe the coordination of EVs, BESSs and traditional units involved in automatic generation control (AGC).	***(05)***
3A.	Analyze the analytic hierarchy process (AHP) model for the dispatch of EV battery with a suitable diagram.	***(05)***
3B.	Select the cloud-based energy management as a service (EMaaS) framework and Explain with a suitable diagram.	***(05)***
4A.	Distinguish between IEC 61850 standard for Communication Standard and Extending IEC 61850 standard for electric vehicle modeling.	***(05)***
4B.	Analysis the dynamical modelling of EV connected to single-phase smart grid node. Also mathematical derive the derivation for the active power and reactive power delivered from the vehicle into the single-phase grid or from grid to the vehicle.	***(05)***
5A.	Write a comparative analysis among economic, social and environmental dimensions of plug-in hybrid electric vehicles (PHEV) technology into the smart grid.	***(05)***

5B. A test grid model is shown in Fig.5B.

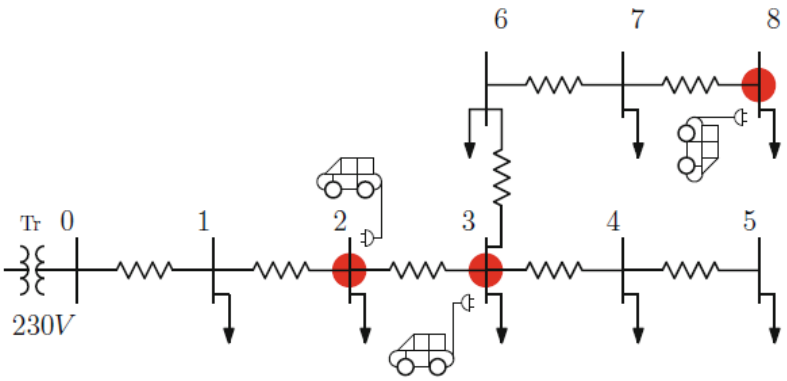

Fig 5B A test grid model with 8-Node Grid Topology

This is a residential grid with eight nodes, each one serving as a residence. Three PEVs are assumed to be connected to the grid at 18 h and during different charging periods (they disconnect respectively at 06 h, 04 h and 04 h30 in the next morning). PEVs are assumed to have a certain initial state of charge (40%, 20% and 50% of the available capacity (16 kWh) respectively). They are connected on the nodes highlighted with a solid dark dots in the grid. The 24 hours forecast of the total load profile for the transformer is considered. The voltage at the transformer node is fixed at 230V. Chargers are restricted to maximum charging/discharging rates of 3kW, and batteries have nominal 20kWh capacities. Nevertheless, only 80% of the capacity (16 kWh) is available (to reduce impact on the battery lifespans). A standard low voltage cable is employed on these lines (25mm^2 section, 0.78Ω/km). These charging management problems are evaluated by single tariff and two tariff scenarios. Analysis this problem and justify which scenario is better. ***(05)***