

DEPARTMENT OF ELECTRICAL ENGINEERING, NIT CALICUT
II SEMESTER M.TECH – END TEST EXAMINATION WINTER SEMESTER 2019-20
INDUSTRIAL POWER AUTOMATION
EE 6226 D HYBRID ELECTRIC VEHICLE

Time: 2 Hours**Max. Marks: 20**

Answer all questions

1. A). What is charge efficiency and C-rate of the battery. (1)
B). Differentiate BoL and EoL. (1)
2. An EV battery has a 100% SOC of 85 kWh. The battery can be charged at high power when the battery DOD is maintained within a range of 20% to 100%. The pack has 96 cells in series per string with 74 parallel strings. Each cell has an average no-load cell voltage during charge of 3.64 V and an internal resistance of 65 mΩ.
i) Determine the battery terminal voltage, current, and efficiency for a 120 kW charge.
ii) What approximate time is required to charge the battery from a DOD of 100% to 20%? (3)
3. A NiMH HEV battery pack is sized based on the following requirements: 10,000 cycles of 3 kWh is per day energy requirement, a 6.5 Ah cell with a rated voltage of 1.2 V and an index of $L = 1.5$.
i) What is BoL and EoL storage capacity?
ii) What is the total number of cells required?
iii) What is the pack voltage if the cells are all in series?
iv) If the peak power is 30 kW, what is the P/E ratio of the battery? (4)
4. Write short notes on the following charging methods.
i) Burp charging, ii) IUI charging, iii) CVCC charging and iv) smart charging (4)
5. Explain in detail about Level 1, 2 and 3 charging method,
[You are expected to cover: Block diagram of level 1, 2 and 3 charging with short explanations and tabulate the values of voltage, current, power and time consumption for all three charge types] (4)
6. Draw the structure and circuit configuration for EV charging supply equipment from grid. (3)

Life is ten percentage what you experience and ninety percentage how you respond to it
