
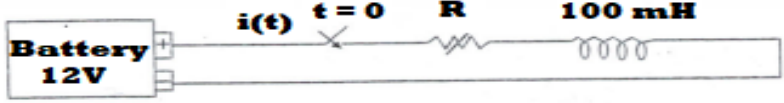
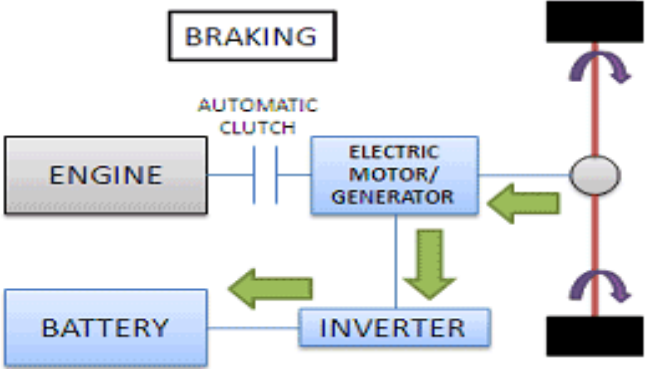


| Name: | |  | |
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| Enrolment No: | | | |
| UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2022 | | | |
| Course: Electric Vehicle and Battery Management System | | Semester : V | |
| Program: B. Tech (Automotive Design Engineering) | | Time : 03 hrs. | |
| Course Code: MEAD 3013 | | Max. Marks: 100 | |
| Instructions: All section questions are compulsory. | | | |
| SECTION A (5Qx4M=20Mark) | | | |
| S. No. | | Marks | CO |
| Q 1 | List out advantages of fuzzy logic based energy management control strategy in electric and hybrid vehicles? | 4 | CO1 |
| Q 2 | What is the significance of a communication network in EVs? Explain the functions of the in-vehicle communication network. | 4 | CO1 |
| Q 3 | Define the configuration of v/f controlled induction motor drive with field weakening mode and constant-torque mode. | 4 | CO2 |
| Q 4 | Explain the power flow control modes for a series-parallel hybrid vehicle. | 4 | CO3 |
| Q 5 | Explain the four-quadrant chopper control of DC motor. | 4 | CO2 |
| SECTION B (4Qx10M= 40 Marks) | | | |
| Q 6 | Define SOB with active and passive circuit approach. Also explain the significance of the each methods used. | 10 | CO5 |
| Q 7 | Describe the terms State-of-Charge, Depth-of-Discharge, and State of Health as applied to lithium ion batteries used in the electric vehicles. | 10 | CO3 |
| Q 8 | <p>An electric vehicle has motor rating of 50kW, and battery pack rating is 20kWh. Calculate following parameters:</p> <p>(i) Is it possible to drive 200 km range considering vehicle weight 800 Kg and maximum speed of 65 Km/h, Justify with proper parameters?</p> <p>(ii) Calculate current with 0.5C, 1C and 5C rate.</p> <p>(iii) What is the electrical motor power output if the total efficiency of power converter and motor combination is 96%.</p> <p>(iv) What is the maximum power that can be transmitted to the wheels if the transmission efficiency is 94%?</p> <p style="text-align: center;">OR</p> <p>Draw the block diagram of a general Fuzzy Logic Controller (FLC) and show the core components of the FLC and the inputs and outputs relevant to a hybrid electric vehicle control.</p> | 10 | CO4 |

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| Q 9 | With neat diagram explain the operation of full wave phase controlled rectifier with RLE load with suitable waveforms for electric vehicles. | 10 | CO3 |
| SECTION-C (2Qx20M=40 Marks) | | | |
| Q 10 | <p>A 12V battery pack is connected to series RL load with $L=100\text{mH}$. The battery pack has rated capacity of 120Ah. At $t=0$ switch is closed and the battery begins to discharge.</p> <div style="text-align: center;">  </div> <p>a) Calculate and plot battery discharge current $i(t)$, if the steady state discharge is $C/5$. Neglect voltage drop.</p> <p>b) Calculate and plot SoC, assuming that $t=0$, the battery is charged to rated capacity.</p> <p>c) Calculate the time according to 70% DoD, assume $t \gg 100\text{ms}$.</p> | 20 | CO5 |
| Q 11 | <p>Design and describe the working of a buck converter/ DC-DC step down converter through the neat circuit diagram and appropriate waveforms of supply voltage, load voltage, load current and voltage across the SCR.</p> <p style="text-align: center;">OR</p> <p>Design a regenerative braking circuit using step-up chopper used in mild hybrid electric vehicle system is represented with below figure also explain its characteristics with neat sketch. Explain the forward motoring and regenerative (forward) braking control of a DC motor with a single chopper. Give circuit diagram, and show the quadrants of operation.</p> <div style="text-align: center;">  </div> | 20 | CO4 |