Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **14EE3030** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MODELLING AND DESIGN OF ELECTRIC AND HYBRID VEHICLE** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Discuss the Important of Hybrid Electric Vehicle | CO1 | 5 |
| b. | Derive the Mathematical modelling of Tractive Effort on the Wheels of an Electric Vehicle and draw the block diagram to implement the same in Matlab/Simulink | CO2 | 15 |
| (OR) | | | | |
| 2. |  | Model the Range of Battery operated electric scooter for the following specifications,  Mass of the vehicle with passenger – 200kg  Drag Co-efficient Cd – 0.75  Frontal area of vehicle – 0.6 m2  Air density - 0.625 kg.m-3  Co-efficient of rolling resistance – 0.007  Gear ratio - 10, radius of the wheel – 0.21m  18V DC motor,  Motor speed – 70 rpm/V  Armature resistance – 0.016 Ω | CO2 | 20 |
| 3. | a. | How does the fuel cell Electric Vehicles differ from battery operated electric vehicles? Explain the Range modeling of Fuel cell Electric Vehicle. | CO2 | 15 |
|  | b. | Discuss the necessity of battery modelling. | CO1 | 5 |
| (OR) | | | | |
| 4. | a. | Compare the driving cycles, used for modelling the Range of Electric Vehicle. | CO1 | 10 |
|  | b. | Derive the mathematical model of Boost Converter and Rectifier with switching resistance losses for EV and HEV applications. | CO2 | 10 |
| 5. | a. | Write the modeling equation to find out the battery power for an electric vehicle. | CO2 | 10 |
|  | b. | Draw the flowchart for the design of battery operated electric vehicle and explain. | CO1 | 10 |
| (OR) | | | | |
| 6. | a. | Derive the Mathematical model of an Inverter with switching resistance losses for EV and HEV applications. | CO2 | 5 |
|  | b. | Explain the Multi-quadrant control of Chopper Fed DC Motor Drive used for EVs and HEVs. | CO1 | 15 |
| 7. | a. | Investigate the different type Converters for Switched Reluctance Motor Drive for EV and HEV applications. | CO3 | 10 |
|  | b. | Explain the general design strategy for the Switched Reluctance Motor Drive. | CO1 | 10 |
| (OR) | | | | |
| 8. | a. | Discuss the methods used to control the BLDC motor by Sensing Back emf. | CO3 | 15 |
|  | b. | Explain the method to extend the speed of EVs and HEVs? | CO3 | 5 |
|  | | **Compulsory:** |  |  |
| 9. | a. | With the help of Mathematical model of Permanent Magnet BLDC motor, Explain the method to obtain the Desired torque and speed at a given load. | CO3 | 15 |
|  | b. | How does the Permanent magnet BLDC motor perform well when compared to the conventional motors for EVs and HEVs? | CO3 | 5 |

ALL THE BEST