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Reg. No. :

Question Paper Code : 11155

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Elective

Applied Electronics

OME 434 – ELECTRIC VEHICLE TECHNOLOGY

Common to: M.E. Big Data Analystics/M.E. Biomedical Engineering/M.E. Biometrics and Cyber Security/M.E. Communication Systems/M.E. Communication and Networking/M.E. Computer Science and Engineering/M.E. Computer Science and Engineering (With Specialization in Artificial Intelligence and Machine Learning/M.E. Computer Science and Engineering (With Specialization in Networks)/M.E. Construction Engineering and Management/M.E. Digital Signal Processing/M.E. Electronics and Communication Engineering/M.E. Electronics and Communication Engineering (Industry Integrated)/M.E. Embedded System Technologies/M.E. Environmental Engineering/M.E. Infrastructure Engineering and Management/M.E. Medical Electronics/ M.E. Mobile and Pervasive Computing/M.E. Multimedia Technology/M.E. Power Electronics and Drives/M.E. Power Systems Engineering/M.E. Software Engineering/M.E. Soil Mechanics and Foundation Engineering/M.E. Structural Engineering/M.E. VLSI Design/M.E. VLSI and Embedded Systems/M.Tech. Biopharmaceutical Technology/M.Tech. Biotechnology/M.Tech. Chemical Engineering/M.Tech. Information Technology/M.Tech. Nano Science and Technology/M.Tech. Plastics Technology/M.Tech. Remote Sensing and GIS/M.Tech. Textile Technology/M.Tech. Textile Technology (with Specialization in Textile Chemistry)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Brief the concept of well-to-wheel.
2. Comment on carbon monoxide and its effects.
3. Write short notes on traction motor characteristics.
4. What do you mean by E-differential?
5. Brief the concept of hybird energy storage.
6. How will you calculate the theoretical capacity of a battery?

7. List the various types of motors used in electric vehicles.

8. How will you obtain dynamic braking in a motor circuit with a resistor?

9. Draw the friction ellipse.

10. Write short notes on the skateboard chassis.

PART B — (5 × 13 = 65 marks)

11. (a) Compare the electric and internal combustion engine vehicle efficency from crude oil to power at the wheels.

Or

(b) How do modern drivetrains reduce the requirements for energy supplies?

12. (a) Brief the power torque characteristics of a vehicle and explain the various types of electric vehicle topologies.

Or

(b) Explain the concept of parallel and series hybird electric vehicle architecture.

13. (a) (i) What kind of battery technologies will be more suitable for energy regeneration storage? (7)

(ii) Explain in detail about the working lithium-ion batteries. (6)

Or

(b) (i) How will the flywheel energy storage concept help in city traffic conditions? (7)

(ii) Explain the chemical reactions of nickel-cadmium batteries. (6)

14. (a) Explain the switched reluctance machine and its principles of Operation with Flux angle current characteristics.

Or

(b) Discuss in detail about the principles of operation of an induction motor.

15. (a) Calculate the maximum tractive effort of an electric vehicle with the consideration of gradient, aerodynamic and rolling resistance.

Or

(b) A 2,000 kg vehicle traveling at 85 mph as to be stopped with a maximum sustained deceleration of 0.65 g. The vehicle ahs a wheelbase of 2.5 m and a front/rear static weight distribution off 49% /51%. The center of gravity is at a height of 0.5 m from the ground.

(i) Find the total force and average power required to bring the vehicle to a stop.

(ii) Find the average power absorbed by the brakes.

(iii) Find the front and rear weight distribution during braking.

PART C — (1 × 15 = 15 marks)

16. (a) Design an electric vehicle braking system with and without gradient and comment on the wheel locking and loss of vehicle directional stability.

Or

(b) What are the choices available for the designers to maximize the electric vehicle range? Comment on the power requirements to overcome each parameter.
