

Total No. of Questions : 8]

SEAT No. :

P-6688

[Total No. of Pages : 2

[6181]-256

B.E. (Mechanical Engineering)

ELECTRICAL AND HYBRID VEHICLE

(2019 Pattern) (Semester - VIII) (Elective - VI) (402051E)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Describe and illustrate the structural configuration of motor layout. [6]
b) Describe and illustrate the energy storage system types and packs classification. [6]
c) Explain and estimate the battery performance parameters. [6]

OR

- Q2)** a) Short note on Battery thermal management system (cooling, thermal protection, control, safety and maintenance). [9]
b) Determine the rating of motor required for following data: Gross curb weight (GCW) = 150Kg Battery rating = 30Ah Working voltage = 72V Efficiency of motor = 95% Acceleration required = 0 to 60 km/hr in 10 seconds Road gradient = 10° Vehicle range = 150Km
Take road friction = 0.01, COF of drag 0.9, density of air = 1.2kg/m³, wheel radius = 0.3m, frontal area of vehicle 0.6m². [9]

- Q3)** a) Differentiate between mechanical differential and electric differential. [6]
b) Explain and illustrate fuel efficiency analysis. [5]
c) Describe and illustrate the brake system and its types. [6]

OR

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Q4) a) Describe and illustrate various electric drive-train topologies and their types (Two-Wheeler, Three-Wheeler, Four-Wheeler Electric Vehicle Configurations). [9]

b) Explain with suitable equations rolling resistance, aerodynamic drag/lift, grading resistance, road resistance, acceleration resistance, total driving resistance. [8]

Q5) a) State and explain the different types of frames used in electric vehicle and the associated Chassis/Frame building problems. [9]

b) Explain need of vehicle testing. What are the national/ international testing/ regulation/licensing/ approval organizations and agencies? [9]

OR

Q6) a) Explain the problems associated with Retrofitting. [6]

b) What is the homologation of vehicles? [6]

c) Describe and illustrate the body loads based on varieties of electric vehicle configurations. [6]

Q7) a) What are the Requirements for Charging System? [8]

b) Describe and illustrate a typical structure of battery management systems (bms) along with its necessity. [9]

OR

Q8) a) Describe and illustrate charger architectures. [8]

b) Explain following : grid voltages, frequencies and wiring, real power, apparent power and power factor. [9]

