315335

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3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answer with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Note:- Give bit-wise marks of Que. 1 as per new numbering. (b.1)

Marks

1. Attempt any FIVE of the following: **10**

a) List the types of electric vehicles.

b) State the ranges of Battery Pack Capacity for :–

i) Buses

ii) Trucks.

b.1) Classify electric drives for electric vehicle based on type of motor.

c) Define :–

i) energy density

ii) specific energy.

P.T.O.

Marks

d) Define

i) energy density

ii) specific energy

e) State the meaning of "deep cycle" of a battery.

f) State the main goal of the EV30@30 campaign.

g) Define the term 'E-Mobility Strategy'.

2. Attempt any THREE of the following: **12**

a) Discuss the advantages and disadvantages of EVs over IC engine Vehicles.

b) Draw and explain the block diagram of an electric vehicle subsystems.

c) Draw and explain a neat labelled block diagram of BLDC motor for torque control.

d) Describe the incentives provided for installation of EV charging infrastructure in Maharashtra.

3. Attempt any THREE of the following: **12**

a) Explain the construction and working of Axis Flux Ironless Permanent Magnet Motor. List any two advantages and limitations.

b) Explain the operation principle of Synchronous reluctance Motor with necessary diagram.

c) Give the classification of batteries used in electric vehicles.

d) Describe V2B/V2H (Vehicle-to-Building/Vehicle-to-Home) system of charging.

Marks

4. Attempt any THREE of the following: **12**

a) Describe the history and evolution of electric vehicles.

b) Differentiate between fuel cell and battery. (Any four points)

c) Estimate the charging time for ebus after 220 km of day running and having balance of 30% SOC. The battery is of 240kW and charging system is DC with 24kW capacity.

d) State the meaning of V2X technology. Discuss its significance in the SMART GRID eco system.

e) Elaborate the policy enforced for road tax and toll in Maharashtra state for Electric Vehicle.

5. Attempt any TWO of the following: **12**

a) Compare EV motors on the basis of :–

i) Power-to-weight ratio

ii) Torque-speed characteristics

iii) Cost of controller

iv) Cost of motor

b) Draw a neat labelled block diagram of BMS and explain the architecture.

c) State and explain the charging modes of EVs defined in IEC standard.

6. Attempt any TWO of the following: **12**

a) i) Explain the mechanical and electrical connections of motors in EVs.

ii) State the physical location of motor in electric vehicle along with examples.

b) Explain the construction and working of Li-ion battery. State its advantages and disadvantages.

c) i) State the meaning of DC fast charging. How is it different from AC charging.

ii) State the precautions to be followed while charging EV.
