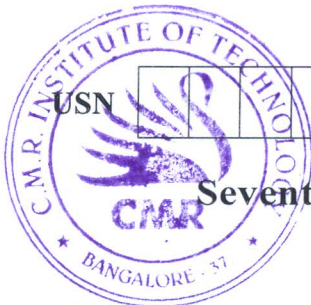


CBCS SCHEME



18EE752

Seventh Semester B.E. Degree Examination, June/July 2023 Electric Vehicles

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Give brief account on Laws of motion in vehicle mechanics and vehicle kinetics. (10 Marks)
- b. Write brief notes on propulsion power and maximum gradability of a vehicle with appropriate equations. (10 Marks)

OR

- 2 a. What is constant FTR? Derive equations for distance traversed and tractive power in an electric vehicle. (12 Marks)
- b. An electric vehicle has the following parameters:
 $M = 800\text{kg}$, $C_D = 0.2$, $A_F = 2.2\text{m}^2$, $C_O = 0.008$, $C_1 = 1 \times 0.6 \times 10^{-6}\text{s}^2/\text{m}^2$. Also take density of air $\rho = 1.18\text{kg}/\text{m}^3$ and acceleration due to gravity $g = 9.81\text{m}/\text{s}^2$. The vehicle is on level road. It accelerates from 0 to 65 mi/h in 10s such that its velocity profile is given by $v(t) = 0.29055t^2$ for $0 \leq t \leq 10\text{s}$.
 - i) Calculate $F_{TR}(t)$ for $0 \leq t \leq 10\text{s}$
 - ii) Calculate $P_{TR}(t)$ for $0 \leq t \leq 10\text{s}$
 - iii) Calculate energy loss due to non conservative forces E_{loss}
 - iv) Calculate Δe_{TR} .(08 Marks)

Module-2

- 3 a. With neat sketch, explain the components of general electric vehicle in detail. (12 Marks)
- b. With appropriate graphs, explain traction motor characteristic and tractive effort of electric vehicle. (08 Marks)

OR

- 4 a. Explain the concept of hybrid electric train briefly. (08 Marks)
- b. Classify hybrid electric vehicles based on its architecture with neat diagrams. Compare and contrast series and parallel hybrid electric drive trains. (12 Marks)

Module-3

- 5 a. Explain the parameters of battery in detail. (10 Marks)
- b. List the types of batteries used in electric vehicles. Explain any two types briefly. (10 Marks)

OR

- 6 a. Draw the structure of fuel cell and explain its operation. (06 Marks)
- b. Discuss the types of fuel cell briefly. (06 Marks)
- c. With neat sketch, explain a fuel cell based electric vehicle. (08 Marks)

Module-4

- 7 a. Explain in detail about DC motor drives with neat sketches of armature voltage and field control. (10 Marks)
- b. Explain various control methods employed in induction motor drive. (10 Marks)

OR

- 8 a. What is a permanent magnet machine? Explain control of PMSM in detail. (10 Marks)
- b. Give a detailed account on SRM control for electric vehicles and explain regenerative braking principle. (10 Marks)

Module-5

- 9 a. Explain the power rating design of the traction motor and engine/generator of series hybrid electric drive train. (10 Marks)
- b. How will you control series hybrid electric train drive? Explain the strategies. (10 Marks)

OR

- 10 a. Explain in detail, the various control strategies of parallel Hybrid drive train. (10 Marks)
- b. Explain the design of engine power capacity of parallel hybrid drive train. (10 Marks)

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