



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year: 2023-2024	Semester: IV
Class: SY B.Tech (Mechanical)	Program: B.Tech
Branch Code: MEC	Pattern: 2022
Name of Course: Electric and Hybrid Vehicles	Course Code: MEC222014
Max. Marks: 60	Duration: 2 Hrs 30 Minutes

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 02 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome of the Question/sub-question.

**Question No. 1 Attempt following Question**

- 1a) Explain with neat sketch working of four stroke diesel engine. (6) CO1

**Question No. 2 Attempt following Question**

- 2a) Explain with neat sketch working of battery coil ignition system used in SI engine (6) CO1

**Question No. 3 Attempt following Question**

- 3a) Explain in detail with neat sketch various phases of Combustion in SI Engines. (8) CO3

**OR**

- 3b) Explain knocking in CI engines. When does it occur? What are the factors affecting knocking in SI Engines? (8) CO3

- 3c) Explain in detail with neat sketch a MPFI system. Also list various advantages of using MPFI system in SI engines. (8) CO3

**OR**

- 3d) Write a note on alternate fuels used in Engines. What are the advantages of using alternate fuels in engines? (8) CO3

**Question No. 4 Attempt following Question**

- 4a) Explain in detail performance parameters of electric vehicles. (8) CO2

**OR**

- 4b) Explain in detail battery management system used in electric vehicles. (8) CO2

- 4c) Calculate battery pack capacity for a two wheeler with range of 150 km and Gross weight of 250 kg (8) CO2 running at a speed of 40 Km/hr. The output voltage is 72 Volt and current drawn = 11 Amp. Consider 5% extra current drawn during acceleration. Assume Battery discharging efficiency= 85 %.

**OR**

- 4d) Calculate battery pack capacity required to propel a 3000 kg electric car for a speed of 80 Km/hr on (8) CO2 a flat road with rolling resistance coefficient of 0.004 and coefficient of drag of 0.4. Assume density of air =  $1.2 \text{ kg/m}^3$  and frontal area =  $3 \text{ m}^2$ . Take Motor efficiency = 80 % and Battery discharging efficiency = 85 %.

**Question No. 5 Attempt following Question**

- 5a) Explain with neat sketch the merits and demerits of hybrid technology over electric vehicles. (8) CO2

**OR**

- 5b) Explain with neat sketch the series hybrid drive train. (8) CO2

- 5c) Explain in detail with neat sketch the working of torque coupling used in hybrid vehicles. (8) CO2

**OR**

- 5d) Explain with neat layouts, the difference between IC engine operated vehicle and Hybrid electric (8) CO2 vehicle. State the merits of Hybrid electric vehicles.

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