

Course outline

How does an NPTEL online course work?

Module 1 - Overview of Electric Vehicles in India

Module 2 - Vehicle Dynamics

Module 2 and 3 - Vehicle Dynamics and EV Subsystems

Module 4 - Storage for EVs

Module 4 - Storage for EVs (contd)

● Lecture 27 - SoH and SoC estimation and Self Discharge - Part 1

● Lecture 28 - SoH and SoC estimation and Self Discharge - Part 2

● Lecture 29 - Battery Pack Development - Part 1

● Lecture 30 - Battery Pack Development - Part 2

● Lecture 31 - Computation of Effective cost of battery - Part 1

● Lecture 32 - Computation of Effective cost of battery - Part 2

● Lecture 33 - Charging Batteries

○ Quiz: Week 5: Assignment 1

○ Quiz: Week 5: Assignment 2

○ Quiz: Week 5: Assignment 3

○ Quiz: Week 5: Assignment 4

● Week 5 - Lecture notes

● Week 5 - Feedback form: Electric Vehicles and Renewable Energy

● Week 5: Solutions

Module 5 - Fundamentals of battery pack design

Module 5 and 6 - Battery Pack Design, Motors and Controllers

Module 6 - EV Motors and Controllers

Module 7&8 - Battery Charging and Swapping, Analytics

Module 9: Renewable Energy - Introduction

Module 10: Renewable Energy - Solar and Wind Energy

Module 11: Renewable Energy

Live Session

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Week 5: Assignment 2

The due date for submitting this assignment has passed.

Due on 2021-09-01, 23:59 IST.

As per our records you have not submitted this assignment.

Q1. We need a 15 kWh battery with nominal voltage at 350V. The cells that we have with us is 3.65V, 14 Ah Li Ion cells, which have voltage of 2.75V at 0% SoC and 4.2V at 100% SoC.

1) Which of the below will be the best configuration for the battery?

0.5 points

- ☐ 3S96P
☐ 3P96S
☐ 96P3S
☐ 96S3P

No, the answer is incorrect.
Score: 0

Accepted Answers:
3P96S

2) What will be the battery voltage when its SoC is 100% ?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 400,415

0.5 points

3) What will be the battery voltage when its SoC is 0% ?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 240,288

0.5 points

Q2. We need to build a 0.5 kWh battery at 48V (using minimum number of 3.65V Li Ion cells).

4) What capacity (Ah) cells will we use?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 9.7,11

0.5 points

5) If the configuration is given by nPmS then n =

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 1

0.5 points

6) If the configuration is given by nPmS then m =

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 13,14

0.5 points

Q3. A battery pack of 375V, 200Ah is to be made to power a luxury car. One battery pack is made with 3.65V, 4Ah, 21700 Cylindrical cells and another pack uses 3.65V, 50Ah prismatic cells.

a. Suggest nPmS configuration for each case to achieve the pack requirements, and find the total number of cells used in both cases. You can answer this question by computing the values in the below table:

Form Factor	n	m	Total number of cells used
21700 Cylindrical cells	[n _i]	[m _j]	[TC _i]
Prismatic cells	[n _j]	[m _j]	[TC _e]

b. A cell in a module of n parallel cells fails in open during operation. Find the resultant nominal pack voltage in V, pack capacity (Ah) for both the packs. You can answer this question by computing the values in the below table.

Form Factor	Resultant Nominal pack Voltage (V)	Resultant Nominal pack Capacity (Ah)
21700 Cylindrical cells	[NPV _i]	[NPC _i]
Prismatic cells	[NPV _j]	[NPC _j]

7) n_1 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 50

0.5 points

8) m_1 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 102,103

0.5 points

9) TC_1 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 5050,5200

0.5 points

10) n_2 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 4

0.5 points

11) m_2 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 102,103

0.5 points

12) TC_2 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 404,416

0.5 points

13) NPV_1 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 360,385

0.5 points

14) NPC_1 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 196

0.5 points

15) NPV_2 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 360,385

0.5 points

16) NPC_2 is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 150

0.5 points

Q4. A Battery pack of configuration 2P14S is made with 3.65V, 13Ah Li Ion cells to power a two wheeler. The pack is used in field for some time and has undergone 5% degradation. The pack operation is limited from 10% SoC to 90% SoC level to improve life.

17) Indicate the SoH (%) of this battery pack

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 95

0.5 points

18) What is DoD (%) of operation?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 80

0.5 points

19) What is the nominal voltage (V) of the pack? (Correct upto 1 decimal place)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 51,51.2

0.5 points

20) What is the nominal capacity in kWh? (Correct upto 2 decimal places)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 1.3,1.4

0.5 points

21) What is the usable capacity (kWh) of the battery pack at current level of SoH? (Correct upto 1 decimal place)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.9,1.2

0.5 points

Q5. State True or False

22) Packs made with cylindrical cells need right pressure to be applied on cells to avoid bulging.

0.5 points

- ☐ True
☐ False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

23) nPmS configuration implies first make series of m cells and then attach n such series in parallel.

0.5 points

- ☐ True
☐ False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

24) In a module of 4 parallel cells of 3.65V, 4Ah each, one cell fails in open. The resultant capacity of module is then reduced to 12Ah.

0.5 points

- ☐ True
☐ False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

25) SoH of a battery pack is the SoH of the strongest cell in the pack.

0.5 points

- ☐ True
☐ False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

Accepted Answers:
False

23) nPmS configuration implies first make series of m cells and then attach n such series in parallel.

0.5 points

- ☐ True
☐ False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

24) In a module of 4 parallel cells of 3.65V, 4Ah each, one cell fails in open. The resultant capacity of module is then reduced to 12Ah.

0.5 points

- ☐ True
☐ False