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Question Paper Version : A

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Battery Management System

Time: 1 hr.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners on the OMR sheets are strictly prohibited.**

1. What type of batteries is commonly used in electric vehicles and requires an active BMS?
a) Alkaline batteries
b) Lithium ion batteries
c) Lead acid batteries
d) Nickel-metal hydride batteries
2. Which component in a BMS is responsible for balancing individual cells within a battery pack?
a) Charge controller
b) Cell balances
c) Voltage regulation
d) Temperature sensor
3. What is the purpose of a pre-charge circuit in a BMS?
a) To discharge the battery
b) To charge the battery
c) To slowly charge a discharged battery before connecting to for the load
d) To regulate battery voltage
4. What is the primary function of a Battery Management System (BMS)?
a) Power Generation
b) Voltage regulation
c) Battery monitoring and control
d) Temperature control
5. Which of the following is crucial parameter monitored by a BMS?
a) Air pressure
b) Humidity
c) State of charge (SOC)
d) wind speed

6. In a BMS, what does the term "C-rate" refer to?
 - a) Charge efficiency
 - b) Discharge efficiency
 - c) Charging/discharging current relative to battery capacity
 - d) Charging/discharging voltage relative for battery capacity
7. What safety features does a BMS provide to prevent thermal runaway in batteries?
 - a) Over current protection
 - b) Over voltage protection
 - c) Thermal management
 - d) Short circuit protection
8. Which communication protocol is commonly used for battery management systems in electric vehicles?
 - a) USB
 - b) Bluetooth
 - c) CAN (Controller Area Network)
 - d) Wi-Fi
9. What is the primary purpose of a coulomb counter in a BMS?
 - a) Measuring battery capacity
 - b) Regulating temperature
 - c) Balancing cell voltages
 - d) Controlling humidity
10. The BMS helps in preventing which of the following issues in batteries?
 - a) Overcharging
 - b) under charging
 - c) over discharging
 - d) All of these
11. What does SoC stand for in the context of batteries?
 - a) State of conductivity
 - b) State of charge
 - c) System of cells
 - d) System of capacitance
12. In a BMS, what is the role of a current sensor?
 - a) measure the battery voltage
 - b) Monitor the charging current
 - c) Regulate the ambient temperature
 - d) Control the discharge rate
13. Which of the following is a common method for thermal management in a BMS?
 - a) Liquid cooling
 - b) Air cooling
 - c) Both a and b
 - d) None of these
14. What is the purpose of a state estimation in a BMS?
 - a) Predicting future battery performance
 - b) Measuring battery capacity
 - c) Balancing cell voltages
 - d) Regulating temperature
15. What parameter does a BMS monitor to ensure proper cell balancing?
 - a) Voltage
 - b) Current
 - c) Temperature
 - d) All of these
16. How does a BMS protect against short circuits?
 - a) By activating fuse
 - b) by disconnecting the load
 - c) By reducing charging current
 - d) All of these

17. What does the term “cell drift” refer to in the context of a RMS?
 - a) Variation in cell voltages over time
 - b) Balancing of cells
 - c) Charging efficiency
 - d) Discharge rate
18. How does a BMS prevent over temperature in a battery pack?
 - a) By disconnecting the load
 - b) By reducing charging current
 - c) By activating cooling systems
 - d) All of these
19. What is the primary advantage of using a modular BMS architecture?
 - a) Increased complexity
 - b) Scalability and flexibility
 - c) Reduced battery capacity
 - d) Lower cost
20. What is the significance of a BMS in extending the overall lifespan of a battery pack?
 - a) Balancing cells
 - b) Monitoring temperature
 - c) Preventing overcharging and over discharging
 - d) All of these
21. In a BMS, what is the purpose of a shunt resistor?
 - a) Measure current
 - b) Regulate voltage
 - c) Monitor temperature
 - d) Balance cells
22. What role does a galvanic isolation play in a BMS?
 - a) Balancing cells
 - b) Preventing electrical interference
 - c) Monitoring temperature
 - d) Controlling charging voltage
23. Which of the following parameters is not typically monitored by an electric vehicle BMS?
 - a) State of Charge (SoC)
 - b) Tire tread depth
 - c) Cell temperature
 - d) State of Health (SoH)
24. What is the purpose of a galvanic isolator in an electric vehicle BMS?
 - a) To prevent dielectrical interference
 - b) To control tire pressure
 - c) To adjust the suspension system
 - d) To measure charging current
25. What is the purpose of a current sensor in an electric vehicle BMS?
 - a) To measure tire wear
 - b) To monitor charging current
 - c) To control steering sensitivity
 - d) To adjust lighting system
26. What is the primary purpose of a coulomb counter in an electric vehicle BMS?
 - a) Measuring tire pressure
 - b) Balancing cell voltage
 - c) Regulating suspension system
 - d) Monitoring battery capacity
27. What role does a watch dog timer play in an electric vehicle BMS?
 - a) Monitoring battery temperature
 - b) Resetting the system if a malfunction is detected
 - c) Adjusting tire pressure
 - d) Controlling transmission

28. In an electric vehicle BMS, how does a voltage regulation contribute to battery safety?
- a) By adjusting tire pressure
 - b) By preventing over voltage
 - c) By controlling suspension system
 - d) By regulating transmission
29. What is the primary function of a BMS during rapid charging in an electric vehicle?
- a) Adjusting tire pressure
 - b) Monitoring and controlling charging current
 - c) Regulating suspension system
 - d) Controlling transmission
30. Which type of battery degradation does an electric vehicle BMS monitor through the State of Health (SoH) parameter?
- a) Tire wear
 - b) Cell aging
 - c) Charging efficiency
 - d) Steering sensitivity
31. What is the significance of a state estimation in an electric vehicle BMS?
- a) Predicting future tire wear
 - b) Predicting future battery performance
 - c) Balancing cell voltages
 - d) Controlling the air conditioning system
32. Which battery pack topology provides redundancy and fault tolerance?
- a) Series
 - b) Parallel
 - c) Series - Parallel
 - d) Tandem
33. In a series – parallel battery pack topology, what does “series” refer to?
- a) Cells connected side by side
 - b) Cells connected end to end
 - c) Cells connected in a loop
 - d) Cells connected randomly
34. What are the advantages of a parallel battery pack topology?
- a) Increased voltage
 - b) Increased capacity
 - c) Faster charging
 - d) Better thermal management.
35. Which battery pack topology connects all cells in series?
- a) Parallel
 - b) Series
 - c) Series - parallel
 - d) Tandem
36. What is the primary function of a battery pack topology in an electric vehicle (EV)?
- a) To control the charging speed
 - b) To determine the size of the battery
 - c) To manage the distribution of power among individual cells
 - d) To regulate the temperature of the battery.

37. What are the main challenges associated with series battery pack topology?
- a) Reduced capacity
 - b) Increased complexity
 - c) Limited voltage
 - d) Difficulty in charging
38. Which topology is commonly used to achieve high voltage and high capacity simultaneously?
- a) Series
 - b) Parallel
 - c) Series-Parallel
 - d) Tandem
39. What is the purpose of a Battery Management System (BMS) in the context of battery pack topology?
- a) To connect cells in series
 - b) To monitor and control individual cells
 - c) To increase the overall capacity
 - d) To improve thermal insulation
40. Which topology allows for hot-swapping of individual battery modules without affecting the entire pack?
- a) series
 - b) parallel
 - c) series-parallel
 - d) Tandem
41. What does the term balancing refer to in the context of battery pack topology?
- a) Equalizing the charge of individual cells
 - b) Replacing faulty cells
 - c) Increasing the overall voltage
 - d) Enhancing thermal conductivity
42. What does voltage sensing help determine in a battery pack?
- a) The temperature of individual cells
 - b) The State of Charge (SoC)
 - c) The internal resistance of the battery
 - d) The capacity of individual cells
43. How does a temperature sensor contribute to battery pack sensing?
- a) Monitoring external environmental conditions
 - b) Regulating the charging speed
 - c) Ensuring safe operating temperatures for cells
 - d) Balancing the charge among cells.
44. Which parameter is commonly sensed to monitor the health of individual cells in a battery pack?
- a) Voltage
 - b) Temperature
 - c) Capacity
 - d) All of these

45. What is the purpose of battery pack sensing in an electric vehicle?
- a) Regulating the temperature of the battery
 - b) Monitoring the state of charge
 - c) controlling the charging the speed
 - d) Determining the size of the battery
46. How does impedance spectroscopy contribute for battery pack sensing?
- a) Monitoring the temperature of individual cells
 - b) Measuring the State of Charge (SoC)
 - c) Analyzing the internal resistance of the battery
 - d) Controlling the charging speed.
47. What is the role of a current sensor in battery pack sensing?
- a) Measuring the flow of electrical energy
 - b) Monitoring the temperature of the battery
 - c) Regulating the voltage of individual cells
 - d) Balancing the charge among cells
48. Which sensing parameter is essential for predicting and preventing thermal runaway in a battery pack?
- a) Voltage
 - b) Temperature
 - c) Current
 - d) Coulomb count
49. What is the purpose of a coulomb counter in battery pack sensing?
- a) Measuring the flow of electrical energy
 - b) Monitoring the temperature of the battery
 - c) Counting the charge and discharge cycles
 - d) Regulating the voltage of individual cells
50. Which sensing technique is commonly used to measure the state of charge (SoC) of a battery pack?
- a) Voltage sensing
 - b) Current sensing
 - c) Temperature sensing
 - d) Coulomb counting.

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