

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code

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Third Semester B.E. Degree Examinations, January 2025

INTRODUCTION TO ELECTRIC VEHICLE

Duration: 1 hr

Max. Marks: 50

Instructions to the Candidates:

- All questions are compulsory
- Each question carries 1 mark
- Use only black ball point pen
- Darkening two circles for the same question makes the answer invalid
- Damaging/overwriting, using whiteners on the OMR are strictly prohibited.

Q.No

Question

- 1 What is the major limitation of Electric Vehicles compared to conventional vehicles?
A. Higher emissions B. Limited range
C. Increased noise pollution D. Higher top speeds
- 2 Which technological advancement in 1859 was crucial for the development of electric vehicles?
A. Lead-acid rechargeable battery B. Internal combustion engine
C. Alternator D. Electric starter
- 3 Which component in EVs converts electrical energy from the battery into mechanical energy to drive the wheels?
A. Transmission B. Electric motor
C. Power electronics D. Thermal management system
- 4 When did the Renaissance of electric vehicles begin, sparked by oil crises and environmental concerns?
A. 1830s B. 1890s C. 1970s D. 2000s
- 5 Which type of Electric Vehicle uses both a battery-powered motor and an internal combustion engine?
A. BEV B. HEV C. PHEV D. FCEV
- 6 Which country had over 80% of its new car sales as EVs in 2022?
A. USA B. India C. Norway D. China
- 7 Which of the following is a key advantage of EVs over internal combustion engine (ICE) vehicles?
A. More complex drivetrain B. Higher fuel consumption
C. Instant torque for quick acceleration D. Slower acceleration
- 8 What major development in 2012 significantly changed the electric vehicle market?
A. Launch of Nissan Leaf B. Release of Tesla Model S
C. Launch of the Ford Model T D. Development of hydrogen fuel cells
- 9 Which of the following EV types cannot be plugged in to charge?
A. BEV B. HEV C. PHEV D. FCEV
- 10 Which type of electric vehicle uses hydrogen as its primary energy source?
A. HEV B. PHEV C. FCEV D. BEV
- 11 Which of the following is NOT a type of mechanical energy storage system (MSS)?
A. Pumped hydro storage (PHS) B. Compressed air energy storage (CAES)
C. Lithium-ion battery D. Flywheel energy storage (FES) (FES)
- 12 Which storage device is best known for its ability to deliver peak power instantly?
A. Lead-acid battery B. Nickel-cadmium battery
C. Super capacitor D. Sodium-sulphur battery

- 13 Why is it important to have a BMS for monitoring battery cell temperature?
A. To maximize battery charge capacity
B. To prevent thermal runaway and ensure safe operation
C. To increase the battery's energy density
D. To increase the discharge rate of the battery
- 14 What is the key disadvantage of passive balancing in a BMS?
A. It increases the complexity of the BMS
B. It uses resistors to dissipate energy, leading to energy loss
C. It is expensive to implement
D. It requires too much current for small batteries
- 15 Which electrolyte is common in Nickel-based batteries?
A. Potassium hydroxide B. Phosphoric acid C. Sodium hydroxide D. Sulphuric acid
- 16 In a BMS, the "State of Charge" (SoC) refers to
A. The total energy capacity of the battery
B. The current voltage of the battery
C. The remaining charge in the battery relative to its total capacity
D. The maximum current the battery can supply
- 17 What does the "State of Health" (SoH) of a battery indicate?
A. The remaining capacity of the battery
B. The ability of the battery to accept charge
C. The battery's overall condition, including aging effects
D. The voltage drop across the battery terminals
- 18 Why is balancing important in a Battery Management System?
A. To ensure that all cells charge and discharge equally
B. To increase the energy density of the battery
C. To prevent the battery from overheating
D. To improve the lifespan of the battery
- 19 What is the main purpose of cell balancing in a BMS?
A. To optimize the charging cycle
B. To prevent deep discharge of cells
C. To ensure all cells in a pack have the same voltage
D. To reduce the weight of the battery
- 20 Which of the following conditions can cause a Battery Management System to trigger an alarm?
A. Excessive cell temperature
B. Voltage imbalance
C. Overcurrent situation
D. All of the above
- 21 Which factor primarily limits the range of an electric vehicle?
A. Motor speed
B. Battery capacity and efficiency
C. Torque delivery
D. Regenerative braking
- 22 Which of the following motors is commonly used in household appliances like fans and pumps?
A. Shunt DC Motor
B. Series DC Motor
C. Synchronous Motor
D. Induction Motor
- 23 The main difference between a brushed DC motor and a brushless DC motor is:
A. The absence of a commutator in the brushless motor
B. The size of the rotor
C. The type of magnetic material used
D. The type of armature winding
- 24 For variable speed applications, which of the following types of motors is preferred?
A. Synchronous motor
B. Induction motor
C. Universal motor
D. Stepper motor
- 25 Which motor is preferred for high torque, low-speed applications like conveyor belts?
A. Series DC Motor B. Shunt DC Motor C. Synchronous Motor D. Brushless DC Motor
- 26 In a brushless DC motor, the position of the rotor is typically detected using:
A. Hall sensors B. Slip rings C. Stator windings D. Resistors
- 27 A universal motor can operate on:
A. Only DC B. Only AC C. Both AC and DC D. Three-phase AC only
- 28 In an induction motor, slip is zero when:
A. The rotor speed is zero
B. The rotor speed equals synchronous speed
C. The motor is under full load
D. The supply voltage is increased

- 29 The purpose of a flywheel in motor applications is to:
 A. Reduce motor speed B. Store energy and reduce speed fluctuations
 C. Increase the motor torque D. Maintain constant current
- 30 Which type of motor is most commonly used in air conditioners and refrigerators?
 A. Stepper Motor B. Squirrel Cage Induction Motor
 C. Series DC Motor D. Brushless DC Motor
- 31 The energy density of a battery is typically measured in:
 A. W/kg B. Wh/kg C. W/m² D. Wh/m³
- 32 The cycle life of an ultra-capacitor depends most on
 A. Voltage rating B. Equivalent Series Resistance (ESR)
 C. Operating temperature and voltage D. Energy density
- 33 Which factor affects the power density of a fuel cell?
 A. Membrane conductivity B. Catalyst surface area
 C. Fuel flow rate D. All of the above
- 34 What is a key limitation of lithium-ion batteries compared to ultra-capacitors?
 A. Lower energy density B. Shorter cycle life
 C. Higher cost D. Faster charge and discharge
- 35 Which factor directly affects aerodynamic drag?
 A. Frontal area of the vehicle B. Coefficient of drag C. Air density D. All of the above
- 36 Total tractive effort required by a vehicle includes:
 A. Rolling resistance B. Aerodynamic drag
 C. Gradient resistance D. All of the above
- 37 What is the primary source of rolling resistance in a vehicle?
 A. Engine friction B. Tire deformation and surface interaction
 C. Aerodynamic drag D. Gradient resistance
- 38 Transmission efficiency is calculated as the ratio of:
 A. Output power to input power B. Input torque to output torque
 C. Input power to output power D. Input speed to output speed
- 39 The effect of increased vehicle mass is most evident in:
 A. Higher rolling resistance B. Increased gradient resistance
 C. Reduced acceleration and efficiency D. All of the above
- 40 How does reducing vehicle mass affect the total energy consumption of an electric vehicle?
 A. Increases energy consumption B. Decreases energy consumption
 C. No effect on energy consumption D. Only impacts speed
- 41 Which of the following describes a Level 1 EV charging station?
 A. Uses a 120V AC outlet and is the slowest type of EV charging
 B. Uses a 240V AC outlet and provides fast charging
 C. Uses direct current (DC) for rapid charging
 D. Is only available at public charging stations
- 42 What is the primary benefit of installing a DC fast charger (Level 3) over a Level 1 or Level 2 charger?
 A. Requires less maintenance B. Provides the fastest charging speed
 C. Uses less energy D. Is cheaper to install
- 43 What is the main role of a Charge Point Operator (CPO) in EV charging infrastructure?
 A. Selling electric vehicles to consumers B. Managing and maintaining charging stations
 C. Setting national EV charging standards D. Supplying power to the grid
- 44 Which of the following best describes the commissioning process for EV charging stations?
 A. Removing the charging station from service
 B. Testing and certifying that the charging station is safe and operational
 C. Setting up payment options
 D. Securing the charger to the ground

- 45 Which term describes the technology that enables two-way communication between EVs and the grid?
A. Smart metering B. Ancillary services C. Vehicle-to-Grid (V2G) D. Fast charging
- 46 What is the purpose of smart meters in EV charging stations?
A. To reduce the speed of charging B. To monitor energy usage and facilitate billing
C. To increase battery capacity D. To prevent grid connections
- 47 In a smart grid, what is the role of ancillary services?
A. Providing primary power to homes B. Supporting grid stability and reliability
C. Supplying power directly to electric vehicles D. Charging electric vehicles faster
- 48 Which of the following is a major benefit of installing EV charging stations with smart metering capabilities?
A. Faster vehicle acceleration B. Higher vehicle battery capacity
C. Better energy management and load balancing D. Reduced installation cost
- 49 What type of power does a DC fast charger deliver to an electric vehicle?
A. Alternating current (AC) B. Direct current (DC)
C. Pulsating current D. Split-phase current
- 50 In the installation of EV charging stations, which of the following is essential for safety?
A. High-speed internet B. Proper grounding and electrical protection
C. Increased power frequency D. Maximum current supply

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