CENTRAL POLYTECHNIC COLLEGE, THARAMANI-600 113.

(An Autonomous Institution)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGG.

QUESTION BANK

EEE51020 – ELECTRIC VEHICLE TECHNOLOGY

U.NO	Q.NO	QUESTIONS
1	1	What is the Full form of EV? (a) Electric Vehicle (b) Engine Van (c) Energy Vehicle (d) Electric Van **Ans:Electric Vehicle**
1	2	First mass-produced modern EV? (a) Tata Nano (b) Ford Model T (c) Honda Accord (d) Nissan Leaf **Ans:Nissan Leaf**
1	3	Which feature makes EVs quieter? (a) No engine combustion (b) Small tyres (c) Light weight (d) No gearbox **Ans:No engine combustion**
1	4	Select motor type for high torque hills (a) Stepper (b) Induction (c) BLDC (d) Servo **Ans:BLDC**
1	5	Main need for EVs is to reduce? (a) Emissions (b) Speed (c) Tyre wear (d) Horn noise **Ans:Emissions**
1	6	EVs reduce dependency on? (a) Air (b) Fossil fuels (c) Paint (d) Plastic **Ans:Fossil fuels**
1	7	BEV stands for? (a) Battery Energy Van (b) Basic Engine Vehicle (c) Battery Electric Vehicle (d) Big Electric Van **Ans:Battery Electric Vehicle**
1	8	PHEV stands for? (a) Plug-in Hybrid EV (b) Petrol Hybrid EV (c) Power High EV (d) Partial Hybrid EV **Ans:Plug-in Hybrid EV**
1	9	Why are HEVs fuel efficient? (a) Use both engine and motor (b) Lighter tyres (c) Shorter body (d) More seats **Ans:Use both engine and motor**
1	10	Which EV type best for city traffic?

(a) BEV (b) Steam
(c) Petrol (d) Diesel
Ans:BEV

U.NO	Q NO	QUESTIONS
1	11	Which EV type can run on fuel & battery?

(a) BEV (b) HEV
(c) FCEV (d) PEV
Ans:HEV

1	12	Higher EV cost is due to?

(a) Battery cost (b) Tyre size
(c) Paint cost (d) Seat design
Ans:Battery cost

1	13	EVs emit zero?

(a) Tailpipe emissions (b) Water vapour
(c) Tyre noise (d) CO_2 from tyres
Ans:Tailpipe emissions

1	14	Why does EV cost drop over time?

(a) Seats cheaper (b) Tyre prices rise
(c) Battery tech improvement (d) Road tax change
Ans:Battery tech improvement

1	15	Lowering vehicle mass improves?

(a) Range (b) Seat comfort
(c) Paint quality (d) Horn volume
Ans:Range

1	16	End-of-life disposal mainly involves?

(a) Batteries (b) Seats
(c) Paint (d) Horn
Ans:Batteries

1	17	Recycling batteries is important because?

(a) Change paint (b) Recover materials
(c) Reduce tyre wear (d) Increase horn sound
Ans:Recover materials

1	18	EV technology integrates?

(a) Motor + Battery + Controller (b) Engine + Carburetor
(c) Tyre + Axle only (d) Radiator + Gearbox
Ans:Motor + Battery + Controller

1	19	Motor in EV replaces?

(a) Tyre (b) Horn
(c) Engine (d) Gear
Ans:Engine

1	20	Common EV layout is?

(a) Front motor (b) Rear engine
(c) Side motor (d) Mid engine

Ans:Front motor

.NO	Q NO	QUESTIONS	
1	21	Why front-motor layout is popular?	
		(a) Better traction	(b) Cheaper paint
		(c) More seats	(d) Smaller tyres
		Ans:Better traction	
1	22	Select layout for better handling	
		(a) Steam drive	(b) Rear engine
		(c) Side motor	(d) Mid motor
		Ans:Mid motor	
1	23	EV cables transmit?	
		(a) Electrical power	(b) Heat
		(c) Oil	(d) Sound
		Ans:Electrical power	
1	24	Choosing thicker cable affects?	
		(a) Tyre wear	(b) Current capacity
		(c) Seat height	(d) Paint colour
		Ans:Current capacity	
1	25	Motor converts?	
		(a) Electrical → Mechanical energy	(b) Mechanical → Electrical
		(c) Chemical → Mechanical	(d) Heat → Electrical
		Ans:Electrical → Mechanical energy	
1	26	Induction motor is?	
		(a) Hydraulic motor	(b) DC motor
		(c) AC motor	(d) Pneumatic motor
		Ans:AC motor	
1	27	EV controller manages?	
		(a) Power flow	(b) Paint colour
		(c) Tyre grip	(d) Horn volume
		Ans:Power flow	
1	28	Controller ensures?	
		(a) Efficient power use	(b) Paint adhesion
		(c) Tyre shine	(d) Seat comfort
		Ans:Efficient power use	
1	29	Power electronics in EV control?	
		(a) Seat design	(b) Energy flow
		(c) Tyre size	(d) Paint
		Ans:Energy flow	
1	30	Battery stores?	
		(a) Thermal energy	(b) Mechanical energy
		(c) Chemical energy	(d) Nuclear energy
		Ans:Chemical energy	

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1	31	Which battery type is most used in EVs? (a) Lithium-ion (b) Lead-acid (c) Nickel-cadmium (d) Silver-zinc **Ans:Lithium-ion**
1	32	Why lithium-ion preferred? (a) Louder horn (b) Cheaper tyres (c) Better paint (d) High energy density **Ans:High energy density**
1	33	Using larger battery affects? (a) Paint colour (b) Seat fabric (c) Range (d) Horn **Ans:Range**
1	34	Nickel-metal hydride used in? (a) Hybrid EVs (b) Petrol cars (c) Diesel buses (d) Steam cars **Ans:Hybrid EVs**
1	35	Plug-in refers to? (a) Changing tyres (b) Charging with connector (c) Painting (d) Replacing seats **Ans:Charging with connector**
1	36	EV battery life measured in? (a) Days (b) Cycles (c) Hours (d) Minutes **Ans:Cycles**
1	37	Ultracapacitor stores? (a) Electrical energy (b) Fuel (c) Air (d) Oil **Ans:Electrical energy**
1	38	Ultracapacitor helps in? (a) Quick acceleration (b) Slowing paint fade (c) Increasing horn volume (d) Tyre grip **Ans:Quick acceleration**
1	39	Add ultracapacitor for? (a) Tyre width (b) Paint design (c) Boost acceleration (d) Seat height **Ans:Boost acceleration**
1	40	Fast charging reduces? (a) Charging time (b) Vehicle weight (c) Emissions (d) Tyre wear **Ans:Charging time**

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1	41	Why DC fast charging is useful?

(a) Changes paint (b) Makes tyres stronger
(c) Improves seat comfort (d) Reduces downtime
Ans:Reduces downtime

1 42 For faster charging, choose?
(a) Hand crank (b) AC slow
(c) Solar (d) DC fast
Ans:DC fast

1 43 Charging standard CCS means?
(a) Combined Charging System (b) Central Charging Station
(c) Common Cable Supply (d) Current Control System
Ans:Combined Charging System

1 44 Solar charging uses?
(a) Turbine (b) Photovoltaic cells
(c) Carburetor (d) Dynamo
Ans:Photovoltaic cells

1 45 Why solar charging is sustainable?
(a) Renewable source (b) No seat change
(c) Bigger tyres (d) Louder horn
Ans:Renewable source

1 46 Solar charging ideal for?
(a) Painting (b) Racing
(c) Off-grid areas (d) Engine cooling
Ans:Off-grid areas

1 47 In remote areas, choose charging from?
(a) Solar (b) Diesel
(c) Coal (d) Oil
Ans:Solar

1 48 Solar panels convert?
(a) Heat to oil (b) Light to electricity
(c) Water to steam (d) Air to water
Ans:Light to electricity

1 49 Which renewable source is easiest to integrate for EV charging?
(a) Solar (b) Coal
(c) Oil (d) Gas
Ans:Solar

1 50 Analyse the uses of Wireless charging
(a) Radiator (b) Gearbox
(c) Inductive coupling (d) Tyres
Ans:Inductive coupling

U.NO	Q NO	QUESTIONS
2	1	Which motor is widely used in EVs due to high efficiency? (a) DC (b) Induction (c) BLDC (d) Universal **Ans:BLDC**
2	2	Torque in Induction motor is produced due to? (a) Back (b) Slip (c) Field current (d) Brushes **Ans:Slip**
2	3	Which motor requires commutator and brushes? (a) BLDC (b) Induction (c) DC (d) SRM **Ans:DC**
2	4	Which motor has constant torque characteristics? (a) BLDC (b) DC series (c) Induction (d) SRM **Ans:BLDC**
2	5	Which motor uses electronic commutation? (a) DC (b) BLDC (c) Induction (d) SRM **Ans:BLDC**
2	6	Which motor is rugged, low cost and widely used in EV buses? (a) BLDC (b) Induction (c) SRM (d) DC **Ans:Induction**
2	7	In BLDC motors, position sensing is usually done by? (a) Resistors (b) Hall sensors (c) Relays (d) Fuses **Ans:Hall sensors**
2	8	The rotor of Induction motor is usually made of? (a) Laminated steel (b) Copper winding (c) Permanent magnet (d) Carbon **Ans:Laminated steel**
2	9	In DC motors, back emf is proportional to? (a) Torque (b) Speed (c) Resistance (d) Current **Ans:Speed**
2	10	Which motor has non-linear torque characteristics but simple construction? (a) Induction (b) SRM (c) BLDC (d) DC **Ans:SRM**

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2	11	In a series hybrid, the engine drives? (a) Motor (b) Wheels (c) Generator (d) Battery **Ans:Generator**
2	12	Series HEDT uses which coupling? (a) Mechanical (b) Hydraulic (c) Electrical (d) None **Ans:Electrical**
2	13	Which hybrid type allows engine to run at optimal efficiency? (a) Parallel (b) Series (c) Plug-in (d) Mild **Ans:Series**
2	14	In series HEDT, propulsion is provided by? (a) Engine (b) Motor (c) Battery only (d) Both Engine and motor **Ans:Motor**
2	15	Which is a drawback of series HEDT? (a) Simple design (b) Higher cost (c) Low efficiency (d) Both b & c **Ans:Both b & c**
2	16	Power rating of an EV motor depends mainly on? (a) Speed (b) Vehicle weight (c) Battery type (d) Tyres **Ans:Vehicle weight**
2	17	Continuous power rating ensures? (a) Hill climbing ability (b) Long drive operation (c) Quick acceleration (d) Short trips **Ans:Long drive operation**
2	18	Which rating is higher: continuous or peak power? (a) Continuous (b) Peak (c) Same (d) None **Ans:Peak**
2	19	Power rating design is used to size? (a) Tyres (b) Battery & motor (c) Chassis (d) Lights **Ans:Battery & Motor**
2	20	The design power is usually based on? (a) Maximum load (b) Average driving cycle (c) idle condition (d) Braking **Ans:Average driving cycle**

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2	21	Peak Power Source is required during? (a) Parking (b) Hill climbing (c) Reverse (d) Normal cruising **Ans:Hill climbing**
2	22	PPS is usually provided by? (a) Battery only (b) Engine (c) Motor (d) Both Motor & Battery **Ans:Both motor & battery**
2	23	PPS helps mainly in? (a) Acceleration (b) Energy saving (c) Idling (d) Braking **Ans:Acceleration**
2	24	Peak power duration is usually? (a) Continuous (b) Few seconds to minutes (c) 1 hour (d) All day **Ans:Few seconds to minutes**
2	25	PPS design depends on? (a) Motor size (b) low voltage (c) no power (d) none **Ans:Motor size**
2	26	In parallel HEDT, engine and motor both can? (a) Drive wheels independently (b) Drive generator only (c) Charge battery only (d) Remain idle **Ans:Drive wheels independently**
2	27	Parallel hybrid provides better? (a) Efficiency (b) Battery life (c) Noise control (d) Transmission **Ans:Efficiency**
2	28	Which is a drawback of parallel HEDT? (a) Complex transmission (b) Low efficiency (c) Higher noise (d) No regerating braking **Ans:Complex transmission**
2	29	Coupling in parallel hybrid is? (a) Electrical (b) Hydraulic (c) Mechanical (d) None **Ans:Mechanical**
2	30	In parallel hybrids, motor assists mainly during? (a) Braking (b) High Load (c) Idling (d) Praking **Ans:High load**

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2	31	Torque coupling combines power at?	
		(a) Wheels	(b) Transmission
		(c) Motor shaft	(d) Generator
		Ans:Transmission	
2	32	Speed coupling regulates?	
		(a) Torque	(b) Gear ratio
		(c) Motor speed	(d) Voltage
		Ans:Torque distribution	
2	33	Which coupling is better for city traffic?	
		(a) Torque	(b) Speed
		(c) Both	(d) None
		Ans:Torque	
2	34	Speed coupling mainly assists?	
		(a) Transmission ratio	(b) Engine idle
		(c) Braking	(d) Battery
		Ans:Transmission ratio	
2	35	Which coupling is more complex?	
		(a) Torque	(b) Speed
		(c) Both same	(d) None
		Ans:Speed	
2	36	SRM stands for?	
		(a) Switched Rectifier Motor	(b) Switched reluctance motor
		(c) Simple rotor motor	(d) static reluctance motor
		Ans:Switched Reluctance Motor	
2	37	The torque in SRM is produced by?	
		(a) Magnetic reluctance	(b) Back emf
		(c) Eddy current	(d) Slip
		Ans:Magnetic reluctance	
2	38	SRM rotor contains?	
		(a) Winding	(b) Permanent magnet
		(c) Laminationed steel	(d) Commutator
		Ans:Laminated steel	
2	39	A major drawback of SRM is?	
		(a) High cost	(b) Noise & vibration
		(c) Low efficiency	(d) Brushes
		Ans:Noise & vibration	
2	40	SRM requires what for operation?	
		(a) Rotor winding	(b) Startor excitation sequece
		(c) commutator	(d) Permanent magnet
		Ans:Stator excitation sequence	

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2	41	SRM converter usually uses? (a) Motor (b) Transformer (c) SCRs (d) Light **Ans:SCRs**
2	42	SRM drive needs position detection for? (a) Rotor position (b) Speed (c) Braking (d) Battery **Ans:Rotor position**
2	43	Which motor has highest fault tolerance? (a) SRM (b) DC motor (c) synchronous (d) Inductiom **Ans:SRM**
2	44	Which application best suits SRM? (a) Low-speed cars (b) High speed traction (c) Pumps (d) Fans **Ans:High-speed traction**
2	45	Converter for SRM must handle? (a) Unidirectional current (b) Bidirectional current (c) Zero current (d) AC only **Ans:Unidirectional current**
2	46	SRM rotor has? (a) Salient poles (b) Smooth poles (c) Laminationed steel (d) magnetic steel **Ans:Salient poles**
2	47	In SRM, torque ripple is minimized by? (a) Skewing (b) no control (c) no shape (d) frequency **Ans:Skewing**
2	48	Which motor has simple rotor but complex control? (a) BLDC (b) Induction (c) SRM (d) DC **Ans:SRM**
2	49	Power electronic interface for SRM is? (a) Inverter (b) Converter (c) Rectifie (d) Cycloconverter **Ans:Converter**
2	50	Design of SRM involves optimization of? (a) Magnetic material (b) Power (c) Energy (d) Current **Ans: Magnetic material**

U.NO	Q NO	QUESTIONS
3	1	Which component allows current to flow in only one direction? (a) BJT (b) MOSFET (c) Diode (d) Thyristor **Ans:Diode**
3	2	Which device is also known as an SCR? (a) Diode (b) Thyristor (c) MOSFET (d) BJT **Ans:Thyristor**
3	3	Which transistor type is current-controlled? (a) BJT (b) MOSFET (c) IGBT (d) Thyristor **Ans:BJT**
3	4	Which device combines MOSFET input with BJT output? (a) Diode (b) IGBT (c) Thyristor (d) BJT **Ans:IGBT**
3	5	Which semiconductor device is voltage-controlled? (a) BJT (b) MOSFET (c) Thyristor (d) Diode **Ans:MOSFET**
3	6	Which power electronics device can handle the highest current? (a) Thyristor (b) BJT (c) IGBT (d) MOSFET **Ans:Thyristor**
3	7	Which converter changes DC to AC? (a) Rectifier (b) Inverter (c) Chopper (d) Cycloconverter **Ans:Inverter**
3	8	Which converter changes AC to DC? (a) Inverter (b) Rectifier (c) Chopper (d) Cycloconverter **Ans:Rectifier**
3	9	In EVs, an inverter is mainly used for? (a) Charging (b) Speed control (c) AC motor drive (d) Voltage regulation **Ans:AC motor drive**
3	10	Which is a type of DC-DC converter? (a) Boost (b) Inverter (c) Rectifier (d) Cycloconverter **Ans:Boost**

U.NO	Q NO	QUESTIONS
3	11	Which is a key safety concern in EVs? (a) High voltage (b) Low speed (c) Fuel tank leak (d) Chain breakage **Ans:High voltage**
3	12	What does PPE stand for in safety? (a) Personal Power Equipment (b) Personal Protective Equipment (c) Public Power Engine (d) Protective Power Enclosure **Ans:Personal Protective Equipment**
3	13	Which is a precaution while working on EV electronics? (a) Remove jewelry (b) Use plastic tools (c) Work on wet floor (d) Ignore insulation **Ans:Remove jewelry**
3	14	Which standard covers EV electrical safety? (a) ISO 26262 (b) ISO 9001 (c) ISO 14001 (d) ISO 50001 **Ans:ISO 26262**
3	15	Which hazard is caused by battery short-circuit? (a) Fire (b) Noise (c) Dust (d) Vibration **Ans:Fire**
3	16	Which hazard is specific to lithium-ion EV batteries? (a) Memory effect (b) Thermal runaway (c) Water ingress (d) Slow charging **Ans:Thermal runaway**
3	17	Which component detects object distance in autonomous EVs? (a) Ultrasonic sensor (b) Diode (c) Resistor (d) Capacitor **Ans:Ultrasonic sensor**
3	18	Which sensor type is used for lane detection? (a) Camera (b) Inductor (c) Capacitor (d) Resistor **Ans:Camera**
3	19	Which tech enables self-driving cars? (a) GPS & sensors (b) Manual clutch (c) Gearbox (d) Carburetor **Ans:GPS & sensors**
3	20	A cyber risk for EVs is? (a) Tire puncture (b) Hacking (c) Brake wear (d) Rust **Ans:Hacking**

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3	21	Which control method measures rotor flux linkage? (a) Phase flux linkage (b) Phase inductance (c) Modulated signal (d) Observer-based **Ans:Phase flux linkage**
3	22	Phase inductance method works by measuring? (a) Resistance (b) Inductance (c) Voltage (d) Current **Ans:Inductance**
3	23	Modulated signal injection is used for? (a) Speed sensing (b) Flux estimation (c) Gear shifting (d) Braking **Ans:Flux estimation**
3	24	Mutually induced voltage method uses? (a) Back EMF (b) Magnetic field (c) Current (d) Resistance **Ans:Back EMF**
3	25	Observer-based method estimates? (a) Rotor position (b) Tire wear (c) Brake pressure (d) Temperature **Ans:Rotor position**
3	26	Which is a passive electronic component? (a) Diode (b) Capacitor (c) MOSFET (d) BJT **Ans:Capacitor**
3	27	Which semiconductor has the fastest switching speed? (a) BJT (b) Thyristor (c) MOSFET (d) IGBT **Ans:MOSFET**
3	28	What is a chopper ? (a) AC-DC converter (b) DC-DC converter (c) DC-AC converter (d) AC-AC converter **Ans:DC-DC converter**
3	29	Which hazard can occur if EV insulation fails? (a) Electric shock (b) Noise (c) Heat loss (d) Vibration **Ans:Electric shock**
3	30	What is the primary role of hazard management? (a) Eliminate all hazards (b) Identify, assess, and control hazards (c) Ignore minor hazards (d) Increase production **Ans:Identify, assess, and control hazards**

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3	31	What does EV stand for? (a) Electric Vehicle (b) Emergency Vehicle (c) Energy Van (d) Electrical Van **Ans:Electric Vehicle**
3	32	Which EV sensor detects wheel rotation? (a) Resistor (b) Thermistor (c) Hall sensor (d) Capacitor **Ans:Hall sensor**
3	33	Which tech is essential for autopilot? (a) Carburetor (b) GPS (c) Gearbox (d) Diesel pump **Ans:GPS**
3	34	Which attack can disrupt EV navigation? (a) Braking (b) GPS spoofing (c) Overcharging (d) Tire puncture **Ans:GPS spoofing**
3	35	Which control method does not require physical sensors? (a) Hybrid (b) Sensor-based (c) Manual (d) Sensor-less **Ans:Sensor-less**
3	36	Which factor influences phase inductance measurement? (a) Rotor position (b) Tire size (c) Battery capacity (d) Vehicle weight **Ans:Rotor position**
3	37	Modulated signal injection improves? (a) Lighting (b) High-speed braking (c) Charging (d) Low-speed performance **Ans:Low-speed performance**
3	38	Observer-based methods use? (a) GPS (b) Manual input (c) Mathematical models (d) Tires **Ans:Mathematical models**
3	39	Which device converts AC to AC at different frequencies? (a) Cycloconverter (b) Inverter (c) Rectifier (d) Chopper **Ans:Cycloconverter**
3	40	Which safety device disconnects power in fault? (a) Circuit breaker (b) Wattmeter (c) Voltmeter (d) Ammeter **Ans:Circuit breaker**

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3	41	Which hazard can occur if EV is hacked? (a) Noise (b) Loss of control (c) Heat loss (d) Vibration **Ans:Loss of control**
3	42	Which unit measures inductance? (a) Henry (b) Ohm (c) Volt (d) Ampere **Ans:Henry**
3	43	Which method estimates flux linkage indirectly? (a) Direct measurement (b) Observer-based (c) Sensor-based (d) Manual method **Ans:Observer-based**
3	44	Which control method is most suitable for low-speed operation? (a) Modulated signal injection (b) Phase inductance (c) Phase flux linkage (d) Observer-based **Ans:Modulated signal injection**
3	45	Which hazard is related to battery overheating? (a) Tire wear (b) Rusting (c) Thermal runaway (d) Vibration **Ans:Thermal runaway**
3	46	Which power device has the highest voltage rating? (a) IGBT (b) MOSFET (c) BJT (d) Diode **Ans:IGBT**
3	47	Which is a current-controlled power device? (a) BJT (b) MOSFET (c) IGBT (d) Diode **Ans:BJT**
3	48	Which unit measures electric potential? (a) Volt (b) Ampere (c) Ohm (d) Watt **Ans:Volt**
3	49	What is the main role of converters in EVs? (a) Cooling (b) Storage (c) Power conversion (d) Communication **Ans:Power conversion**
3	50	Which EV component is most sensitive to overvoltage? (a) Tires (b) Electronics (c) Frame (d) Seat **Ans:Electronics**

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4	1	Which is a type of hybrid electric vehicle? (a) Micro (b) Heavy (c) Mega (d) Ultra **Ans:Micro**
4	2	A mild hybrid uses: (a) Large battery (b) Small battery with engine assist (c) No battery (d) Only solar **Ans:Small battery with engine assist**
4	3	Which hybrid runs short distances on battery only? (a) Micro hybrid (b) Mild hybrid (c) Full hybrid (d) None **Ans:Full hybrid**
4	4	Which hybrid needs charging from a plug? (a) Plug-in hybrid (b) Mild hybrid (c) Micro hybrid (d) None **Ans:Plug-in hybrid**
4	5	Which hybrid has the smallest battery? (a) Micro (b) Full (c) Plug-in (d) Series **Ans:Micro**
4	6	Which hybrid has the largest battery? (a) Plug-in (b) Mild (c) Micro (d) Series **Ans:Plug-in**
4	7	Mild hybrids mainly assist with: (a) Braking (b) Acceleration (c) Cooling (d) Lighting **Ans:Acceleration**
4	8	Full hybrids can operate: (a) Only on motor (b) Only on engine (c) On motor or engine (d) Neither **Ans:On motor or engine**
4	9	Micro hybrids use: (a) Engine stop-start (b) Large motors (c) Solar panels (d) Plug charging **Ans:Engine stop-start**
4	10	Plug-in hybrids require: (a) External charging (b) No fuel (c) No battery (d) No motor **Ans:External charging**

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4	11	In series hybrid, the engine: (a) Drives wheels (b) Makes electricity for motor (c) Runs alternator only (d) None **Ans:Makes electricity for motor**
4	12	In parallel hybrid, the motor and engine: (a) Work together (b) Work separately only (c) Run alternator (d) Drive pump **Ans:Work together**
4	13	Series-parallel hybrid is also called: (a) Complex hybrid (b) Mild hybrid (c) Micro hybrid (d) Plug-in hybrid **Ans:Complex hybrid**
4	14	Series hybrid uses: (a) Generator (b) Fuel tank (c) Gearbox (d) Radiator **Ans:Generator**
4	15	Parallel hybrid can: (a) Use both engine and motor (b) Use engine only (c) Use motor only (d) None **Ans:Use both engine and motor**
4	16	Series hybrids have simpler: (a) Transmission (b) Brakes (c) Wheels (d) Suspension **Ans:Transmission**
4	17	Complex hybrids combine: (a) Series and parallel (b) Parallel and micro (c) Micro and mild (d) None **Ans:Series and parallel**
4	18	Parallel hybrids can run on: (a) Motor only (b) Engine only (c) Both (d) None **Ans:Both**
4	19	Series hybrid efficiency is: (a) Low speed (b) High speed (c) Same at all speeds (d) None **Ans:Low speed**
4	20	Parallel hybrids are efficient at: (a) Highway speeds (b) Low speed (c) Reverse (d) Idling **Ans:Highway speeds**

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4	21	Which part stores electricity? (a) Battery (b) Carburetor (c) Radiator (d) Gearbox **Ans:Battery**
4	22	Common motor in hybrids: (a) Brushless DC (b) Stepper (c) Fan motor (d) Gear motor **Ans:Brushless DC**
4	23	Regenerative braking changes motion into: (a) Heat (b) Sound (c) Electricity (d) Light **Ans:Electricity**
4	24	Regenerative braking saves: (a) Paint (b) Fuel (c) Weight (d) Space **Ans:Fuel**
4	25	Hybrid propulsion has: (a) Engine and electric motor (b) Only engine (c) Only motor (d) Pedals **Ans:Engine and electric motor**
4	26	Full hybrid engines can: (a) Only make electricity (b) Only drive wheels (c) Do both (d) None **Ans:Do both**
4	27	Series hybrid propulsion includes: (a) Motor and generator (b) Motor only (c) Engine only (d) Pedals **Ans:Motor and generator**
4	28	Parallel hybrid needs: (a) Pedals (b) Clutch (c) Windmill (d) Boiler **Ans:Clutch**
4	29	Plug-in hybrids can charge from: (a) Radiator (b) Wall socket (c) Alternator only (d) Fan **Ans:Wall socket**
4	30	Hybrid motors help with: (a) Acceleration (b) Braking (c) Cooling (d) Painting **Ans:Acceleration**

U.NO	Q NO	QUESTIONS
4	31	Noise can be reduced by: (a) Removing battery (b) Big tires (c) Sound insulation (d) Removing brake **Ans:Sound insulation**
4	32	Vibration can be reduced by: (a) Bigger battery (b) More weight (c) Balanced mounts (d) Loud horn **Ans:Balanced mounts**
4	33	Electric motors are quieter than: (a) Engines (b) Batteries (c) Brakes (d) Lights **Ans:Engines**
4	34	Noise reduction improves: (a) Weight (b) Comfort (c) Speed (d) Fuel use **Ans:Comfort**
4	35	Vibration reduction increases: (a) Safety (b) Noise (c) Safety (d) Weight **Ans:Safety**
4	36	Tyre noise can be reduced by: (a) Smaller brakes (b) Heavier tyres (c) Louder horn (d) Better tread **Ans:Better tread**
4	37	Cabin noise can be reduced by: (a) Thinner glass (b) Bigger engine (c) Less battery (d) Insulation **Ans:Insulation**
4	38	Vibration from engine reduced by: (a) Plastic mounts (b) Metal mounts (c) Rubber mounts (d) Steel mounts **Ans:Rubber mounts**
4	39	Electric drive reduces: (a) Tyre size (b) Exhaust noise (c) Battery life (d) Weight **Ans:Exhaust noise**
4	40	Noise is measured in: (a) Decibels (b) Litres (c) Watts (d) Volts **Ans:Decibels**

U.NO	Q NO	QUESTIONS
4	41	Control system manages: (a) Lights (b) Power flow (c) Wipers (d) Paint **Ans:Power flow**
4	42	Hybrid control unit decides: (a) Seat height (b) Paint colour (c) Power source (d) Wheel size **Ans:Power source**
4	43	Types of hybrid control: (a) Rule-based (b) Random (c) Manual only (d) None **Ans:Rule-based**
4	44	Power split device controls: (a) Power distribution (b) Colour (c) Heat (d) Fuel tank **Ans:Power distribution**
4	45	Energy management improves: (a) Noise (b) Efficiency (c) Colour (d) Size **Ans:Efficiency**
4	46	Control system gets input from: (a) Sensors (b) Sensors (c) Seats (d) Doors **Ans:Sensors**
4	47	Hybrid systems are analysed for: (a) Performance (b) Paint (c) Seat design (d) Wiper size **Ans:Performance**
4	48	Electronic control improves: (a) Tyre size (b) Paint (c) Efficiency (d) Weight **Ans:Efficiency**
4	49	Vehicle modes include: (a) EV mode (b) Paint mode (c) Seat mode (d) None **Ans:EV mode**
4	50	Types of hybrid vehicle: (a) DC motor (b) AC motor (c) Series-parallel (d)BLDCmotor **Ans:Series-Parallel**

U.NO	Q NO	QUESTIONS
5	1	Which device converts chemical energy into electrical energy in electric vehicles? (a) Battery (b) Fuel Cell (c) Capacitor (d) Alternator **Ans:Fuel Cell**
5	2	A PEM fuel cell operates at approximately what temperature? (a) 80°C (b) 200°C (c) 500°C (d) 1000°C **Ans:80°C**
5	3	A key advantage of fuel cells over batteries is: (a) Shorter life (b) Slower charging (c) Continuous fuel supply (d) Heavier weight **Ans:Continuous fuel supply**
5	4	Which type of fuel cell is most commonly used in EVs? (a) PEMFC (b) SOFC (c) MCFC (d) AFC **Ans:PEMFC**
5	5	Which technology uses solid oxide as electrolyte? (a) PEMFC (b) SOFC (c) MCFC (d) AFC **Ans:SOFC**
5	6	The electrolyte in PEMFC is: (a) Nafion (b) Zirconia (c) Potassium hydroxide (d) Nickel oxide **Ans:Nafion**
5	7	Identify a key obstacle in fuel cell adoption. (a) High efficiency (b) Low noise (c) High cost (d) Zero emissions **Ans:High cost**
5	8	Which is NOT an obstacle for FC EVs? (a) High cost (b) Low fuel availability (c) Zero emissions (d) Storage difficulty **Ans:Zero emissions**
5	9	The electrochemical process in a fuel cell is based on which principle? (a) Faraday's Law (b) Newton's Law (c) Joule's Law (d) Ohm's Law **Ans:Faraday's Law**
5	10	What is the main output of a fuel cell besides electricity? (a) Heat (b) Water (c) Air (d) Hydrogen **Ans:Water**

U.NO	Q NO	QUESTIONS
5	11	What does the I-V curve of a fuel cell represent? (a) Power vs. Voltage (b) Current vs. Voltage (c) Efficiency vs. Time (d) Fuel vs. Consumption **Ans:Current vs. Voltage**
5	12	The voltage drop in I-V curve at high current is mainly due to: (a) Ohmic loss (b) Activation loss (c) Concentration loss (d) Thermal loss **Ans:Ohmic loss**
5	13	Calculate the power if fuel cell voltage is 48 V and current is 10 A. (a) 380 W (b) 480 W (c) 580 W (d) 680 W **Ans:480 W**
5	14	For the same voltage, doubling the current will: (a) Double power (b) Halve power (c) Triple power (d) No change **Ans:Double power**
5	15	If voltage is 0.7 V/cell and 50 cells are connected in series, total voltage is: (a) 35 V (b) 25 V (c) 70 V (d) 50 V **Ans:35 V**
5	16	Which loss occurs due to slow reaction at electrodes? (a) Activation loss (b) Ohmic loss (c) Concentration loss (d) Thermal loss **Ans:Activation loss**
5	17	Calculate current if power is 2.4 kW and voltage is 48 V. (a) 25 A (b) 30 A (c) 40 A (d) 50 A **Ans:50 A**
5	18	In I-V curve, the maximum power point occurs at: (a) High voltage (b) Low voltage (c) Intermediate voltage (d) Zero voltage **Ans:Intermediate voltage**
5	19	Which fuel is most commonly oxidized in PEMFC? (a) Hydrogen (b) Methanol (c) Ethanol (d) Natural Gas **Ans:Hydrogen**
5	20	Hydrogen storage in vehicles is mainly in: (a) Solid form (b) Liquid form (c) Gas form (d) Gel form **Ans:Gas form**

U.NO	Q NO	QUESTIONS
5	21	Which gas is oxidized at the anode in PEMFC? (a) Oxygen (b) Hydrogen (c) Nitrogen (d) Carbon dioxide **Ans:Hydrogen**
5	22	Which parameter measures the power output per unit mass? (a) Efficiency (b) Specific Power (c) Durability (d) Voltage **Ans:Specific Power**
5	23	If a fuel cell has efficiency of 50% and input fuel power is 2 kW, output is: (a) 0.5 kW (b) 1 kW (c) 1.5 kW (d) 2 kW **Ans:1 kW**
5	24	Which is more durable? (a) PEMFC (b) SOFC (c) MCFC (d) AFC **Ans:SOFC**
5	25	Fuel cell stack power is proportional to: (a) No. of cells (b) Color (c) Size of car (d) Type of wheels **Ans:No. of cells**
5	26	Which reduces efficiency? (a) Water flooding (b) Proper cooling (c) Correct humidity (d) Adequate fuel **Ans:Water flooding**
5	27	Specific power is measured in: (a) W/kg (b) V/A (c) A/W (d) W/m^2 **Ans:W/kg**
5	28	Which parameter indicates reliability over years? (a) Efficiency (b) Durability (c) Specific power (d) Weight **Ans:Durability**
5	29	Which type of FC has highest efficiency? (a) SOFC (b) PEMFC (c) MCFC (d) AFC **Ans:SOFC**
5	30	Calculate efficiency if output power is 800 W and input fuel power is 1 kW. (a) 60% (b) 70% (c) 80% (d) 90% **Ans:80%**

U.NO	Q NO	QUESTIONS
5	31	Which factor affects fuel cell performance the most? (a) Weight (b) Temperature (c) Color (d) Shape **Ans:Temperature**
5	32	Which factor increases fuel consumption? (a) High load (b) Low temperature (c) Low humidity (d) High voltage **Ans:High load**
5	33	Which affects efficiency the most? (a) Color (b) Fuel purity (c) Size (d) Weight **Ans:Fuel purity**
5	34	Freeze capacity in a fuel cell vehicle refers to ability to operate in: (a) Low temperature (b) High voltage (c) High altitude (d) Vacuum **Ans:Low temperature**
5	35	Freeze capacity is critical in: (a) Hot weather (b) Cold weather (c) Rainy weather (d) Dusty areas **Ans:Cold weather**
5	36	Which factor increases freeze capacity? (a) Antifreeze system (b) Larger tires (c) Stronger motor (d) Bigger stack **Ans:Antifreeze system**
5	37	Which affects freeze capacity negatively? (a) Ice formation (b) Proper heating (c) Antifreeze (d) Warm start **Ans:Ice formation**
5	38	Lifetime cost of a fuel cell vehicle depends largely on: (a) Fuel cost (b) Paint color (c) Tire size (d) Battery color **Ans:Fuel cost**
5	39	Lifetime cost is reduced by: (a) Mass production (b) Painting (c) Increasing weight (d) Smaller tires **Ans:Mass production**
5	40	Which cost is excluded from lifetime cost? (a) Maintenance (b) Fuel (c) Insurance (d) Paint **Ans:Paint**

U.NO	Q NO	QUESTIONS
5	41	Which is NOT a part of the fuel cell system? (a) Stack (b) Compressor (c) Radiator (d) Speaker **Ans:Speaker**
5	42	The fuel cell stack is part of the: (a) Body (b) Engine (c) System (d) Decoration **Ans:System**
5	43	Which component supplies air to the fuel cell? (a) Injector (b) Compressor (c) Radiator (d) Pump **Ans:Compressor**
5	44	Which part removes excess heat? (a) Radiator (b) Motor (c) Inverter (d) Compressor **Ans:Radiator**
5	45	Which system component manages water removal? (a) Radiator (b) Humidifier (c) Inverter (d) Compressor **Ans:Humidifier**
5	46	Which part compresses incoming air? (a) Humidifier (b) Radiator (c) Compressor (d) Inverter **Ans:Compressor**
5	47	Which is used to humidify incoming air? (a) Humidifier (b) Radiator (c) Compressor (d) Inverter **Ans:Humidifier**
5	48	In fuel cell maintenance, which is essential? (a) Replacing electrodes (b) Repainting body (c) Adding coolant (d) Changing tires **Ans:Replacing electrodes**
5	49	Which improves durability? (a) Proper maintenance (b) Overheating (c) Fuel contamination (d) Freezing **Ans:Proper maintenance**
5	50	Which type of maintenance is preventive? (a) Cleaning stack (b) Repairing after failure (c) Replacing motor (d) Painting **Ans:Cleaning stack**

PART B & PART C

UNIT NO	PART B/C	Q.NO	Question
1	B	1	State the main need for electric vehicles in modern transportation.
1	B	2	List any four advantages of electric vehicles over internal combustion engine vehicles
1	B	3	State the difference between BEV and PHEV.
1	B	4	List the major components of an electric vehicle
1	B	5	State the different types of cables used in EV.
1	B	6	List any four types of batteries used in electric vehicles
1	B	7	Draw the construction of ultra capacitor
1	B	8	Draw the basic layout of electric vehicle.
1	B	9	Discuss about the working and types of wireless EV charging
1	B	10	State the charging standards of ultracapacitors
2	B	1	Give the types of motors used in EV.
2	B	2	Apply electronic commutation to explain how brushes are eliminated in BLDC motors.
2	B	3	List out the advantages of BLDC motor.
2	B	4	List the key components of DC motor drive system
2	B	5	State the speed control methods of induction motor.
2	B	6	Draw the construction diagram of DC motor and label the parts.
2	B	7	List the functions of a Peak Power Source (PPS)
2	B	8	Draw the block diagram of a Series Hybrid Electric Drive Train.
2	B	9	State the advantages and disadvantages of parallel HEDT.
2	B	10	Draw the diagram of HEDT with speed coupling of an electric transmotor.
3	B	1	Give the types of thyristors.
3	B	2	Draw the symbol and structure of transistors.
3	B	3	Describe about hacking.
3	B	4	Write a note about AM and PM methods.
3	B	5	Draw the basic structure of IGBT
3	B	6	Specify the role of Lidar, Radar, GNSS and camera in autonomous EV navigation.
3	B	7	List the possible hacking risks in self-driving cars and apply one preventive method.
3	B	8	Compare N -channel and P- channel MOSFET
3	B	9	Mention the key risks associated with electric vehicles.
3	B	10	State the applications of inverter
4	B	1	Compare micro hybrids and mild hybrids.
4	B	2	Give the difference between parallel and plug in hybrid electric vehicle
4	B	3	Write a note about full hybrids.
4	B	4	List the advantages of a parallel hybrid configuration.
4	B	5	Draw the basic layout of a series hybrid electric vehicle
4	B	6	List out the types of hybrid electric vehicles.
4	B	7	Apply regenerative braking to explain how energy is recovered during city driving.
4	B	8	Apply vibration and noise reduction techniques used in hybrid vehicles.
4	B	9	State the various types of control used in hybrid electric vehicles.
4	B	10	Describe the system analysis factors in hybrid electric vehicle systems
5	B	1	State the advantages of hydrogen fuel cell
5	B	2	List the different types of fuel cell technologies

5	B	3	State why PEM fuel cells are preferred in vehicles
5	B	4	Describe about fuel cell efficiency.
5	B	5	Mention the obstacles faces in guel cell technology.
5	B	6	List out the fuel cell system characteristics
5	B	7	Draw the diagram of hydrogen-air fuel cell
5	B	8	Describe the major components used in hydrogen fuel cell vehicle
5	B	9	Write a note on efficiency and durability in fuel cell.
5	B	10	List the major obstacles to large-scale adoption of fuel cell vehicles
1	C	1	Discuss about the components of electric vehicle.
1	C	2	Explain about the solar EV charging system.
1	C	3	Classify the different types of batteries used in EVs and compare their performance chara
1	C	4	Discuss the construction and working principle of ultra-capacitors with suitable sketch.
1	C	5	Discuss alternate charging sources for electric vehicles.
2	C	1	Explain the construction and operating principle of a BLDC motor drive.
2	C	2	With neat sketch, explain the hybrid electric drive train.
2	C	3	Describe the architecture of a Parallel Hybrid Electric Drive Train and explain mechanic
2	C	4	Draw and explain the block diagram of switched reluctance motor(SRM) drive system.
2	C	5	Explain the series HEDT (Electrical Coupling) with relevant sketch.
3	C	1	Explain the high voltage safety and hazard management in Evs.
3	C	2	Discuss about the safety risks and safety guidance in Evs.
3	C	3	Discuss About converters and inverters.
3	C	4	Draw and explain the working principle of single phase full bridge inverter with wavwfo
3	C	5	Explain the sensorless control based on phase bulk indutance with neat diagram
4	C	1	Draw and explain the architecture of a Series Hybrid Electric Vehicle.
4	C	2	Draw and explain the layout of EV.
4	C	3	Explain how the regenerative braking system is used in hybrid vehicles
4	C	4	Describe the working of a Parallel Hybrid Electric Vehicle.
4	C	5	Discuss the methods used in hybrid vehicles for vibration and noise reduction.
5	C	1	Classify the different fuel cell technologies and compare their suitability for vehicle appl
5	C	2	Draw and explain the electrochemical operating principles of fuel cell.
5	C	3	Discuss the factors affecting the fuel cell characteristics with neat diagram.
5	C	4	Discuss the maintenance followed in fuel cell vehicle.
5	C	5	Explain the system characteristics and life time cost of fuel cell.