

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur– 603203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK



II SEMESTER

IS3261 –Electrical Safety

[M.E. INDUSTRIAL SAFETY ENGINEERING]

Regulation–2023 Academic Year 2024-2025 EVEN

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IS3261 - Electrical Safety

UNIT I: CONCEPTS AND STATUTORY REQUIREMENTS

Introduction – electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment-Indian electricity act and rules-statutory requirements from electrical inspectorate-international standards on electrical safety – first aid-cardio pulmonary resuscitation(CPR).

PART - A (2 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	Define Coulomb's law	BT 1	Remember
2.	Explain Superposition principle.	BT 4	Analyse
3.	Analyze the principle behind electromagnetism.	BT 4	Analyse
4.	How is electrical energy stored?	BT 1	Remember
5.	How energy radiation does take place?	BT 4	Analyse
6.	Differentiate magnetic energy and electrical energy.	BT 2	Understand
7.	Generalize interference.	BT 5	Evaluate
8.	Summarize how energy radiation takes place?	BT 6	Create
9.	Define the terms Electrical safety.	BT1	Remember
10.	Discuss working principle of anyone electrical equipment.	BT 1	Remember
11.	Generalize the rules to be followed under IEA.	BT 5	Evaluate
12.	Describe the salient features of Indian Electricity Act.	BT 1	Remember
13.	Illustrate any four statutory equipment.	BT 3	Apply
14.	Summarize electrical requirement.	BT 6	Create
15.	What does the American International standard say about Electrical safety?	BT 1	Remember
16.	What is first aid? When is it given?	BT 2	Understand
17.	Illustrate any four International standards.	BT 3	Apply
18.	Prepare the procedure to be followed to give first aid.	BT3	Apply
19.	Discuss the principle of Cardio Pulmonary resuscitation.	BT2	Understand
20.	Discuss the need for Electrical safety.	BT2	Understand
21.	What is Shock Circuit?	BT 1	Remember
22.	Describe Fibrillation.	BT 2	Understand
23.	Give what to Do If the Victim Is Responsive during first aid.	BT 2	Understand
24.	What are electrical safety standards and who enforces them?	BT 1	Remember
25.	Write in detail on voltage measuring instruments.	BT 2	Understand

PART – B (16 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	i) State and explain Coulomb's law and write coulomb's law in vector form. (8) ii) Derive the expression for electric field intensity due to line charge distribution. (8)	BT 1	Remember
2.	Explain the concept of capacitance and derive the capacitance for. a. Two dielectric media (6) b. Parallel conductors (5) c. Co-axial cables. (5)	BT 4	Analyse
3.	How electromagnetic interference form an important factor in energy radiation.	BT 5	Evaluate
4.	Elucidate in detail on stored energy and discuss what happens when stored energy is unintentionally released along with its methods of control.	BT 4	Analyse
5.	Account on energy radiation and electromagnetic interference.	BT 1	Remember
6.	i) Detail the statutory requirements in Indian electricity rule and act. (8) ii) Explain the key features of Indian electricity Act. (8)	BT 2	Understand
7.	(i) Summarize the guidelines given by the Indian Electricity Act about Reporting of electrical accidents. (8) (ii) Account on cardio pulmonary resuscitation technique. (8)	BT 6	Create
8.	Explain the procedure for issue of safety certificate given by the electrical inspectorate of tamilnadu.	BT 2	Understand
9.	Outline the General inspection and testing requirements for electrical safety equipment.	BT 1	Remember
10.	Elucidate the construction and working principles of electrical equipment with a suitable application.	BT 4	Analyse
11.	Write in detail about the electrical safety requirements and restricted area works.	BT 2	Understand
12.	(i) Brief on the regulatory bodies and list out the International standards on electrical safety. (8) (ii) Discuss about electrical arc, blast and shock hazards. (8)	BT 5	Evaluate
13.	Generalize the first aid procedure to be carried out after an accident.	BT 3	Apply
14.	Examine the technique to be followed when the victim has no pulse and no respiration.	BT 3	Apply
15.	Discuss briefly about what to Do If the Victim Is Responsive during first aid.	BT 3	Apply
16.	Give and explain about the factors influence the severity of electrical shock.	BT 2	Understand
17.	Write in detail about international standards on electrical safety.	BT 1	Remember

UNIT II: ELECTRICAL HAZARDS

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications-excess energy-current surges-Safety in handling of war equipment-over current and short circuit current- heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc- ignition energy-national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.

PART - A (2 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	What are hazards? How is it classified?	BT 1	Remember
2.	List out some of the electrical hazards.	BT 1	Remember
3.	Illustrate how burns occur in humans.	BT 3	Apply
4.	What is a scald? How is it prevented?	BT 5	Evaluate
5.	List out any four precautions to be followed by humans for safe use of electricity.	BT 2	Understand
6.	Define the term Energy leakage.	BT 2	Understand
7.	What is insulation? Summarize its usefulness.	BT 6	Create
8.	Determine the different classes of insulation.	BT 1	Remember
9.	How are voltage levels classified?	BT 4	Analyse
10.	Excess energy is used in a fruitful manner-Justify.	BT 5	Evaluate
11.	Prepare few procedures on how to maintain safety in handling of war equipments.	BT 2	Understand
12.	Differentiate overcurrent and short circuit current.	BT 4	Analyse
13.	Mention the heating and magnetic effects of current.	BT 2	Understand
14.	Define surge current and mention its causes.	BT 1	Remember
15.	Mention the causes and effects of corona.	BT 3	Apply
16.	What are the sources of static electricity?	BT 1	Remember
17.	State the importance of maintaining safety records.	BT1	Remember
18.	List out the electrical causes of fire and explosion.	BT 6	Create
19.	How will you install lightning arrestor?	BT 4	Analyse
20.	Define earthing and earth resistance.	BT 3	Apply
21.	List out the types of shock current.	BT1	Remember
22.	Define let go current.	BT1	Remember
23.	List out the types of earthing.	BT 2	Understand
24.	Tell about the sectors in ANSI providing safety standards.	BT1	Remember
25.	Mention High and Extra High Voltage levels.	BT1	Remember

PART – B (16 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	How are hazards classified? Explain about the secondary hazards in detail.	BT 1	Remember
2.	Account on the effects of electrocution and effects of electric current through the human body with its preventive measures.	BT 4	Analyse
3.	Give a detailed answer on the different classes of insulation.	BT 1	Remember
4.	i) Give the electrical causes of fire and explosion. (8) ii) Explain the construction and working of a lightning arrester. (8)	BT 5	Evaluate
5.	i) Explain the secondary hazards of electricity. (8) ii) Define the classes of insulation in detail. (8)	BT 3	Apply
6.	Difference between the High, Medium and low voltage classifications and how they relate to industrial generators.	BT 3	Apply
7.	What is Excess electricity? What can we do with this surplus amount of energy?	BT 6	Create
8.	Explain the internal and external sources, causes and prevention of Surge currents.	BT 1	Remember
9.	i) Difference between Overcurrent and short circuit current. (8) ii) List out few safety measures followed by human in use of electricity. (8)	BT 4	Analyse
10.	(i) Elucidate in detail the causes, effects and prevention of corona and describe about corona discharge. (8) (ii) Explain the term earthing and earthing resistance and write a note on maintaining an earth pit. (8)	BT 2 BT 5	Understand Evaluate
11.	Describe the preventive measures in electrical safety with example.	BT 5	Evaluate
12.	Explain the construction, working and installation of a lightning arrester.	BT 1	Remember
13.	Give a detailed description on caution of arc, arc energy, arc energy release, arc energy input and arc surface area.	BT 2	Understand
14.	Summarize on the National Electrical Safety Code ANSI C2.	BT 4	Analyse
15.	Give and discuss about the causes and prevention of electrical fire and explosion.	BT 1	Remember
16.	Discuss about the different types of earthing in detail.	BT 2	Understand
17.	Generalize the definition of static electricity and brief on its sources, conditions of hazards and its control.	BT 6	Create

UNIT III: PROTECTION SYSTEMS

Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections, overload and short circuit protection-no load protection-earth fault protection. FRLS insulation-insulation and continuity test-system grounding-equipment grounding-earth leakage circuit breaker (ELCB)-cable wires-maintenance of ground-ground fault circuit interrupter-use of low voltage-electrical guards- Personal protective equipment – safety in handling hand held electrical appliances tools and medical equipments.

PART - A (2 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	List any four protective schemes.	BT 1	Remember
2.	Explain the types of circuit breakers.	BT 4	Analyse
3.	Evaluate the components of fuse.	BT 5	Evaluate
4.	What is the purpose of overhead relays?	BT 1	Remember
5.	Differentiate between overvoltage and under voltage.	BT 4	Analyse
6.	How are protective schemes given against overvoltage?	BT 2	Understand
7.	Differentiate between Amperage and voltage.	BT 3	Apply
8.	Determine the safety limit of electric current.	BT 6	Create
9.	How will you determine the safety distance from EHV lines?	BT 3	Apply
10.	What is the method of protection of conductors?	BT 2	Understand
11.	List out the types of conductor joints.	BT 5	Evaluate
12.	How are conductor connections classified?	BT 4	Analyse
13.	Differentiate between overload and short circuit protection.	BT 2	Understand
14.	Define earth fault protection.	BT 1	Remember
15.	Abbreviate FRLS. What is the principle of FRLS insulation?	BT 1	Remember
16.	What is the purpose of conducting continuity test?	BTL 1	Remember
17.	Differentiate between system grounding and equipment grounding.	BTL 2	Understand
18.	Prepare the usage of ground fault circuit interrupter.	BTL 6	Create
19.	Mention the use of low voltage.	BTL 3	Apply
20.	Illustrate the role of Personal protective equipment in Electrical safety.	BTL 1	Remember
21.	Give the safety precautions in handling medical equipment.	BTL 2	Understand
22.	List out the types of fuses.	BTL 1	Remember
23.	Give the safe limits of amperage and voltage.	BTL 1	Remember
24.	Classify the types of electrical cables.	BTL 1	Remember
25.	Give the safe distance followed for high tension electrical wires.	BTL 1	Remember

PART – B (16 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	What are fuses? Give the specifications of a fuse link and mention some of its characteristics.	BT 2	Understand
2.	Generalize the technical particular and assembly of outdoor circuit breakers.	BT 3	Apply
3.	Explain in detail the types of protective schemes followed for safety operation.	BT 5	Create
4.	Generalize the types of electrical joints in detail.	BT 5	Evaluate
5.	Explain the effects of amperage on electrical shock and list out some Standard safety precautions.	BT 4	Analyse
6.	Draw and explain the connection diagram for overload relay and list out its types and applications.	BT 2	Understand
7.	Brief on: i)FRLS insulation ii)Ground Fault Circuit interrupter with its internal diagram. (8+8)	BT 4	Analyse
8.	What is insulation testing? Prepare the steps to be followed for insulation test.	BT 1	Remember
9.	i) What is System grounding? List out the purposes for conducting it. (8) ii) Explain the use of grounded circuit conductor for grounding equipment. (8)	BT 2	Understand
10.	Explain about ELCB with a neat sketch.	BT6	Create
11.	i) Describe the necessity of maintenance of grounding. (8) ii) Write a brief note on Underground cables. (8)	BT 4	Analyse
12.	Elaborate the role of Personal Protective equipment (PPE) in electrical safety.	BT 5	Evaluate
13.	i) Mention the uses of low voltage. (8) ii) How are electrical guards used in protection systems? (8)	BT 3	Apply
14.	Prepare the safety precautions followed while handling medical equipments.	BT 1	Remember
15.	Discuss about the overload protection schemes used for electrical equipment.	BT 2	Understand
16.	Explain in detail about the procedures for continuity testing.	BT 2	Understand
17.	Elaborate the need and process of equipment grounding.	BT 5	Evaluate

UNIT IV: SELECTION, INSTALLATION, OPERATION AND MAINTENANCE

Role of environment in selection-safety aspects in application - protection and interlock-self diagnostic features and fail safe concepts-lock out and work permit system-discharge rod and earthing devices- safety in the use of portable tools-cabling and cable joints-preventive maintenance.

PART - A (2 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	Mention the role of environment in the process of selection.	BT 4	Analyse
2.	What are the parameters considered while the process of selection?	BT 1	Remember
3.	Explain the principle of interlocking.	BT 3	Apply
4.	List out the safety precautions to be carried out when working with electricity.	BT 5	Evaluate
5.	Mention few electrical interlocking devices.	BT 3	Apply
6.	Prepare the purpose of interlocking	BT 6	Create
7.	Illustrate the concept of fail-safe concepts	BT 1	Remember
8.	Write a note on self diagnostic features.	BT 2	Understand
9.	How ladder logic is implemented in fail safe design?	BT 2	Understand
10.	What is lockout and name few lockout devices.	BT 2	Understand
11.	What is permit to work system?	BT 1	Remember
12.	What are the requirements of work permit system?	BT 2	Understand
13.	Account on the principle behind discharge rod.	BT 4	Analyse
14.	Name the earthing devices used for electrical safety.	BT 1	Remember
15.	What is the safety behind using portable tools?	BT 4	Analyse
16.	Define cabling	BT 6	Create
17.	Prepare the types of cable joints.	BT 1	Remember
18.	What are underground cables? How is it buried?	BT 5	Evaluate
19.	Generalize the safety precautions carried out during the installation process.	BT 3	Apply
20.	Identify the safety precautions carried out during the installation process.	BT 1	Remember
21.	Give the usage of locks in safety	BT 2	Understand
22.	What is the need for safety grounding?	BT 1	Remember
23.	List out the human factor considerations of different work places	BT 2	Understand
24.	Tell about self-diagnostic feature	BT 2	Understand
25.	Give the functions of a discharge rod.	BT 2	Understand

PART - B (16 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	Discuss the role of environment in the process of selection.	BT 1	Remember
2.	How does a standard electrical interlock work when they are installed in a safety switch.	BT 3	Apply
3.	List out the safety precautions to be carried out when working with electricity.	BT 6	Create
4.	Explain in detail electrical safety in a work place.	BT 3	Apply
5.	Design a self-diagnostic based safety pressure transmitter.	BT 6	Create
6.	Account on the self – diagnostic IC monitors power supply for functional safety.	BT 4	Analyse
7.	Explain the principle of Fail Safe design with help of ladder logic.	BT 5	Create
8.	i) Write a note on lockout and electrical lock out devices. (8) ii) What are the safety measures to be followed while using portable tools? (8)	BT 4	Analyse
9.	i) What is permit to work system and its requirements? (8) ii) Generalize the concept of Fail-safe design. (8)	BT 2	Understand
10.	What are underground cables? Explain the types of joints employed in underground cables.	BT 2	Understand
11.	List and explain the preventive measures to be carried out for underground cables.	BT 1	Remember
12.	What are the special precautions carried out in design, installation and Maintenance of electrical equipment?	BT 1	Remember
13.	How cable jointing plays a major role in electrical safety.	BT 2	Understand
14.	Elucidate on kinds of injuries results from electrical currents.	BT 1	Remember
15.	Discuss about fail safe concept equipment safety.	BT 2	Understand
16.	Explain self-diagnostic feature and its implementation in equipment.	BT 2	Understand
17.	Give and explain the procedure to be followed for preventive maintenance.	BT 4	Analyse

UNIT V: HAZARDOUS ZONES

Classification of hazardous zones-intrinsically safe and explosion proof electrical apparatus-increase safe equipment-their selection for different zones-temperature classification- grouping of gases-use of barriers and isolators-equipment certifying agencies.

PART - A (2 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	What are hazardous zones?	BT 1	Remember
2.	Classify the types of hazardous zones each with an example.	BT 6	Create
3.	Why hazardous zones form an important factor in electrical safety?	BT 2	Understand
4.	Explain with an example-Intrinsically safe electrical apparatus.	BT 5	Evaluate
5.	Differentiate Explosion proof and intrinsically safe electrical apparatus.	BT 2	Understand
6.	How are electrical equipments selected for different zones?	BT 4	Analyse
7.	What are the methods to be followed for increasing the safety for electrical equipments?	BT 4	Analyse
8.	Identify the different classes of temperature classification.	BT 3	Apply
9.	How are grouping of gases takes place?	BT 1	Remember
10.	What are the challenges seen in maintaining electrical safety under hazardous zones?	BT 1	Remember
11.	What is the aim of grouping up of gases?	BT 3	Apply
12.	Name the components of intrinsic safety barrier.	BT 1	Remember
13.	Prepare the usage of barrier in hazardous zones.	BT 1	Remember
14.	Explain the usefulness of isolators employed in electrical hazardous zones.	BT 3	Apply
15.	Categorize the types of hazardous zones.	BT 2	Understand
16.	On what criteria the equipments are selected for different zones of hazards?	BT 2	Understand
17.	State intrinsic safety.	BT 6	Create
18.	List out the components of explosion proof Apparatus.	BT 1	Remember
19.	How temperature gets affected in these hazardous zones?	BT 5	Evaluate
20.	Name few equipment certifying agencies.	BT 4	Analyse
21.	Explain Operational Temperatures?	BT 4	Analyse
22.	What are the Methods of Explosion Protection ?	BT 1	Remember
23.	Define Auto Ignition Temperature	BT 1	Remember
24.	Give the rules to be followed for Marking of Hazardous Area Equipment	BT 5	Evaluate

25.	Installation of cables uses intrinsically safe circuits – Justify.	BT 3	Apply
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PART - B (16 MARKS)

Sl. No	QUESTIONS	BT LEVEL	COMPETENCE
1.	Determine how hazardous zones are classified? How the temperature does get affected due to this zone.	BT 6	Create
2.	How are electrical equipments selected for different zones?	BT 5	Evaluate
3.	i) With a neat sketch, explain intrinsically safe electrical apparatus. (8) ii) What is temperature classification? Explain its categories. (8)	BT 2	Understand
4.	How does a temperature class prove as an important factor for its suitability in hazardous area?	BT 2	Understand
5.	Differentiate intrinsic safe and explosion proof electrical apparatus with a neat diagram.	BT 5	Evaluate
6.	i) What is the difference between intrinsically safe and flameproof equipment? (8) ii) Write a note on intrinsic safety. (8)	BT 2	Understand
7.	Account on how electrical equipments are selected for different hazardous zones.	BT 1	Remember
8.	Elaborate on how gases or vapors get classified in a hazardous location.	BT 1	Remember
9.	(i) What is an intrinsic safety barrier? Explain its components. (8) (ii) Explain about grouping of gases. (8)	BT 3	Apply
10.	With a neat diagram, explain explosion proof electrical apparatus.	BT 1	Remember
11.	Prepare the importance of employing barriers and isolators in electrical safety.	BT 4	Analyse
12.	Discuss the challenges to be met while selecting electrical equipment for hazardous zones.	BT 1	Remember
13.	i) How are electrical barriers used in hazardous zones? (8) ii) Brief on explosion proof electrical apparatus. (8)	BT 4	Analyse
14.	Explain in detail on how to work in hazardous environments.	BT 4	Analyse
15.	How can the workers be safeguarded from voltages induced in communication lines?	BT 1	Remember
16.	Explain how different alarms, indications and communications help in managing safety.	BT 4	Analyse
17.	Discuss about the equipment certifying agencies	BT 1	Remember

Course Outcomes:

Cos	Course Outcome
CO1	Familiarize the basic concepts in electrical circuit and hazards involved in it.
CO2	Analyze the electrical hazards in Industries.
CO3	Evaluate various electrical hazards for protection.
CO4	Analyze different factors and devices to ensure safety.
CO5	Recognize different hazardous zones in Industries.

