SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur–603203.

DEPARTMENT OF

ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

M.E. - INDUSTRIAL SAFETY ENGINEERING

1914203– Electrical Safety

Regulation–2019

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Course Code & Name: 1914203 Electrical Safety
Semester/ Year : II/ 2019-2020 (EVEN)

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).				
1	Define Coulomb's law	BTL 1	Remember	CO1
2	Explain Superposition principle.	BTL 4	Analyse	CO1
3	Analyse the principle behind electromagnetism.	BTL 4	Analyse	CO1
4	How is electrical energy stored?	BTL 1	Remember	CO1
5	How energy radiation does take place?	BTL 4	Analyse	CO1
6	Differentiate magnetic energy and electrical energy.	BTL 2	Understand	CO1
7	Generalize the term electromagnetic interference.	BTL 5	Evaluate	CO1
8	Summarize how energy radiation takes place?	BTL 6	Create	CO1
9	Define the terms Electrical safety.	BTL1	Remember	CO1
10	Discuss working principle of anyone electrical equipment.	BTL 1	Remember	CO1
11	Generalize the rules to be followed under IEA.	BTL 5	Evaluate	CO1
12	Describe the salient features of Indian Electricity Act.	BTL 1	Remember	CO1
13	Illustrate any four statutory equipment.	BTL 3	Apply	CO1
14	Summarize the procedure given by the electrical inspectorate for statutory requirement.	BTL 6	Create	CO1
15	What does the American International standard say about Electrical safety?	BTL 1	Remember	CO1
16	What is first aid? When is it given?	BTL 2	Understand	CO1
17	Illustrate any four International standards..	BTL 3	Apply	CO1
18	Prepare the procedure to be followed to give first aid.	BTL 3	Apply	CO1
19	Discuss the principle of Cardio Pulmonary Resuscitation.	BTL 2	Understand	CO1
20	Discuss the need for Electrical safety.	BTL 2	Understand	CO1
Part – B				
1	i) State and explain Coulomb's law and write coulomb's law in vector form. (5)	BTL 1	Remember	CO1

	ii) Derive the expression for electric field intensity due to line charge distribution. (8)			
2	Explain the concept of capacitance and derive the capacitance for. a. Two dieletric media b. Parallel conductors c. Co-axial cables. (5+4+4)	BTL 4	Analyse	CO1
3	What is electromagnetism? Evaluate the concept of electromagnetism with an example. (13)	BTL 5	Evaluate	CO1
4	Elucidate in detail on stored energy and discuss what happens when stored energy is unintentionally released along with its methods of control. (13)	BTL 4	Analyse	CO1
5	Account on Energy radiation and electromagnetic interference. (13)	BTL 1	Remember	CO1
6	i) Detail the statutory requirements in Indian electricity rule and act. (7) ii) Explain the key features of Indian electricity Act. (6)	BTL 2	Understand	CO1
7	Summarize the guidelines given by the Indian Electricity Act about reporting of electrical accidents. (13)	BTL 6	Create	CO1
8	Explain the procedure for issue of safety certificate given by the electrical inspectorate of Tamilnadu. (13)	BTL 2	Understand	CO1
9	Write in detail on Voltage measuring instruments. (13)	BTL 1	Remember	CO1
10	Outline the General inspection and testing requirements for electrical safety equipment. (13)	BTL 4	Analyse	CO1
11	i) What is meant by stored energy? Why is it hazardous? (7) ii) What type of protection is given to a transformer as per Indian Electricity Act. (6)	BTL 2	Understand	CO1
12	Brief on the regulatory bodies and list out the International standards on Electrical safety. (13)	BTL 1	Remember	CO1
13	Generalize the first aid procedure to be carried out after an accident. (13)	BTL 3	Apply	CO1
14	Examine the technique to be followed when the victim has no pulse and no respiration. (13)	BTL 3	Apply	CO1
Part-C				
1	Elucidate the construction and working principles of electrical equipment with a suitable application. (15)	BTL 6	Create	CO1
2	Write in detail about the electrical safety requirements and restricted area works. (15)	BTL 5	Evaluate	CO1

3	How electromagnetic interference form an important factor in energy radiation. (15)	BTL 5	Evaluate	CO1
4	Account on Cardio Pulmonary Resuscitation technique. (15)	BTL6	Create	CO1
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 equipments-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.				
1	What are hazards? How is it classified?	BTL 1	Remember	CO2
2	List out some of the electrical hazards.	BTL 1	Remember	CO2
3	Illustrate how burns occur in humans.	BTL 3	Apply	CO2
4	What is a scald? How is it prevented?	BTL 5	Evaluate	CO2
5	List out any four precautions o be followed by humans for safe use of electricity.	BTL 2	Understand	CO2
6	Define the term Energy leakage.	BTL 2	Understand	CO2
7	What is insulation? Summarize its usefulness.	BTL 6	Create	CO2
8	Determine the different causes of insulation.	BTL 1	Remember	CO2
9	How are voltage levels classified?	BTL 4	Analyse	CO2
10	Excess energy is used in a fruitful manner-Justify.	BTL 5	Evaluate	CO2
11	Prepare few procedures on how to maintain safety in handling of war equipments.	BTL 2	Understand	CO2
12	Differentiate overcurrent and short circuit current.	BTL 4	Analyse	CO2
13	Mention the heating and magnetic effects of current.	BTL 2	Understand	CO2
14	Define surge current and mention its causes.	BTL 1	Remember	CO2
15	Mention the causes and effects of corona.	BTL 3	Apply	CO2
16	What are the sources of static electricity?	BTL 1	Remember	CO2
17	Explain the control strategy of static electricity.	BTL1	Remember	CO2
18	List out the electrical causes of fire and explosion.	BTL 6	Create	CO2
19	How will you install lightning arrester?	BTL 4	Analyse	CO2
20	Define earthing and earth resistance.	BTL 3	Apply	CO2
Part-B				
1.	How are hazards classified? Explain about the secondary hazards in detail. (13)	BTL 1	Remember	CO2
2.	Account on the effects of electrocution and effects of electric current through the human body with its preventive measures. (13)	BTL 4	Analyse	CO2
3	Give a detailed answer on the different classes of insulation. (13)	BTL 1	Remember	CO2
4	i) Give the electrical causes of fire and explosion. (6) ii) Explain the construction and working of a	BTL 5	Evaluate	CO2

	lightning arrester. (7)			
5	i) Explain the secondary hazards of electricity. (7) ii) Define the classes of insulation in detail. (6)	BTL 3	Apply	CO2
6	Difference between the High, Medium and low voltage classifications and how they relate to industrial generators. (13)	BTL 3	Apply	CO2
7	i) Write a note on High and Extra High Voltage levels. (7) ii) What is Excess electricity? What can we do with this surplus amount of energy? (6)	BTL 6	Create	CO2
8	Explain the internal and external sources, causes and prevention of Surge currents. (13)	BTL 1	Remember	CO2
9	i) Difference between Overcurrent and short circuit current. (7) ii) List out few safety measures followed by human in use of electricity. (6)	BTL 4	Analyse	CO2
10	Elucidate in detail the causes, effects and prevention of corona and describe about coronal discharge. (13)	BTL 2	Understand	CO2
11	How the safety measures are followed while a) Earthing b)Earth pit maintenance (7+6)	BTL 2	Understand	CO2
12	Explain the construction, working and installation of a lightning arrestor. (13)	BTL 1	Remember	CO2
13	Give a detailed description on caution of arc, arc energy, arc energy release, arc energy input and Arc surface area. (13)	BTL 2	Understand	CO2
14	Summarize on the National Electrical Safety Code ANSI C2. (13)	BTL 4	Analyse	CO2
	Part-C			
1.	Describe the preventive measures in electrical safety with example. (15)	BTL 5	Evaluate	CO2
2.	Generalize the definition of static electricity and brief on its sources, conditions of hazards and its control. (15)	BTL 6	Create	CO2
3.	Explain the term earthing and earthing resistance and write a note on maintaining an earth pit. (15)	BTL 5	Evaluate	CO2
4.	What are the parameters to be considered in electric power shock hazards? Explain. (15)	BTL 6	Create	CO2

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				
1.	List any four protective schemes.	BTL 1	Remember	CO3
2.	Explain the types of circuit breakers.	BTL 4	Analyse	CO3
3.	Evaluate the components of fuse.	BTL 5	Evaluate	CO3
4.	What is the purpose of overhead relays?	BTL 1	Remember	CO3
5.	Differentiate between overvoltage and under voltage.	BTL 4	Analyse e	CO3
6.	How are protective schemes given against overvoltage?	BTL 2	Understand	CO3
7.	Differentiate between Amperage and voltage.	BTL 3	Apply	CO3
8.	Determine the safety limit of electric current.	BTL 6	Create	CO3
9.	How will you determine the safety distance from EHV lines?	BTL 3	Apply	CO3
10.	What is the method of protection of conductors?	BTL 2	Understand	CO3
11.	List out the types of conductor joints..	BTL 5	Evaluate	CO3
12.	How are conductor connections classified?	BTL 4	Analyse	CO3
13.	Differentiate between overload and short circuit protection.	BTL 2	Understand	CO3
14.	Define earth fault protection.	BTL 1	Remember	CO3
15.	Abbreviate FRLS. What is the principle of FRLS insulation?	BTL 1	Remember	CO3
16.	What is the purpose of conducting continuity test?	BTL 1	Remember	CO3
17.	Differentiate between system grounding and equipment grounding.	BTL 2	Understand	CO3
18.	Prepare the usage of ground fault circuit interrupter.	BTL 6	Create	CO3
19.	Mention the use of low voltage.	BTL 3	Apply	CO3
20.	Illustrate the role of Personal protective equipment in Electrical safety.	BTL 1	Remember	CO3
Part-B				
1.	What are fuses? Give the specifications of a fuse link and mention some of its characteristics. (13)	BTL 2	Understand	CO3
2.	Generalize the technical particulars and assembly of outdoor circuit breakers. (13)	BTL 3	Apply	CO3
3.	i) Give the general principles of protection. (6) ii) What is a safe distance followed for high tension electrical wires? (7)	BTL 1	Remember	CO3
4.	(i) Explain the different types of circuit breakers with its working principles. (7) (ii) Explain the protection given to electrical equipments against overvoltage and under voltages. (6)	BTL 1	Remember	CO3
5.	Explain the effects of amperage on electrical shock and list out some standard safety precautions. (13)	BTL 4	Analyse	CO3

6.	Draw and explain the connection diagram for overload relay and list out its types and applications. (13)	BTL 2	Understand	CO3
7.	Brief on i) FRLS insulation ii) Ground Fault Circuit interrupter with its internal diagram. (7+6)	BTL 4	Analyse	CO3
8.	What is insulation testing? Prepare the steps to be followed for insulation test. (13)	BTL 1	Remember	CO3
9.	i) What is System grounding? List out the purposes for conducting it. (7) ii) Explain the use of grounded circuit conductor for grounding equipment. (6)	BTL 2	Understand	CO3
10.	How ELCB (Earth Leakage Circuit Breaker) is employed as a method for protective scheme. (13)	BTL 6	Create	CO3
11.	(i) Describe the necessity of maintenance of grounding. (7) (ii) Write a brief note on Underground cables. (6)	BTL 4	Analyse	CO3
12.	Elaborate the role of Personal Protective Equipment (PPE) in electrical safety. (13)	BTL 5	Evaluate	CO3
13.	(i) Mention the uses of low voltage. (7) (ii) How are electrical guards used in protection systems? (6)	BTL 3	Apply	CO3
14.	Prepare the safety precautions followed while handling medical equipments. (13)	BTL 1	Remember	CO3
	Part-C			
1.	Explain in detail the types of protective schemes followed for safety operation. (15)	BTL 5	Evaluate	CO3
2.	Explain about ELCB with a neat sketch. (15)	BTL 6	Create	CO3
3.	Generalize the types of electrical joints in detail (15)	BTL 5	Evaluate	CO3
4.	Account on the safety to be remembered in handling handheld electrical appliances. (15)	BTL 6	Create	CO3
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.				
1.	Mention the role of environment in the process of selection.	BTL 4	Analyse	CO4
2.	What are the parameters considered while the process of selection?	BTL 1	Remember	CO4
3.	Explain the principle of interlocking.	BTL 3	Apply	CO4
4.	List out the safety precautions to be carried out when working with electricity.	BTL 5	Evaluate	CO4
5.	Mention few electrical interlocking devices.	BTL 3	Apply	CO4
6.	Prepare the purpose of interlocking	BTL 6	Create	CO4
7.	Illustrate the concept of fail safe concepts	BTL 1	Remember	CO4

8.	Write a note on self diagnostic features.	BTL 2	Understand	CO4
9.	How ladder logic is implemented in fail safe design?	BTL 2	Understand	CO4
10.	What is lockout and name few lockout devices.	BTL 2	Understand	CO4
11.	What is permit to work system?	BTL 1	Remember	CO4
12.	What are the requirements of work permit system?	BTL 2	Understand	CO4
13.	Account on the principle behind discharge rod	BTL 4	Analyse	CO4
14.	Name the earthing devices used for electrical safety.	BTL 1	Remember	CO4
15.	What is the safety behind using portable tools?	BTL 4	Analyse	CO4
16.	Define cabling	BTL 6	Create	CO4
17.	Prepare the types of cable joints.	BTL 1	Remember	CO4
18.	What are underground cables? How is it buried?	BTL 5	Evaluate	CO4
19.	Generalize the safety precautions carried out during the installation process.	BTL 3	Apply	CO4
20.	Identify the safety precautions carried out during the installation process.	BTL 1	Remember	CO4
	Part-B			
1.	Discuss the role of environment in the process of selection. (13)	BTL 1	Remember	CO4
2.	How does a standard electrical interlock work when they installed in a safety switch. (13)	BTL 3	Apply	CO4
3.	List out the safety precautions to be carried out when working with electricity. (13)	BTL 6	Create	CO4
4.	Explain in detail electrical safety in a workplace. (13)	BTL 3	Apply	CO4
5.	i) Explain the purpose and examples of safety interlocking. (7) ii) Brief on the functions of a discharge rod. (6)	BTL 4	Analyse	CO4
6	Account on the self – diagnostic IC monitors power supply for functional safety. (13)	BTL 4	Analyse	CO4
7.	Explain the principle of Fail Safe design with help of ladder logic. (13)	BTL 5	Create	CO4
8.	i) Write a note on lockout and electrical lock out devices. (7) ii) What are the safety measures to be followed while using portable tools? (6)	BTL 4	Analyse	CO4
9.	i) What is permit to work system and its requirements? (6) ii) Generalize the concept of Fail-safe design. (7)	BTL 2	Understand	CO4
10.	What are underground cables? Explain the types of joints employed in underground cables. (13)	BTL 2	Understand	CO4
11.	What are the preventive measures to be carried out for underground cable? (13)	BTL 1	Remember	CO4

12.	What are the special precautions carried out in design, installation, and maintenance of electrical equipment? (13)	BTL 1	Remember	CO4
13.	How cable jointing plays a major role in electrical safety. (13)	BTL 2	Understand	CO4
14.	Elucidate on kinds of injuries results from electrical currents. (13)	BTL 1	Remember	CO4
	Part-C			
1.	Design a self-diagnostic based safety pressure transmitter. (15)	BTL 5	Evaluate	CO4
2.	Explain work permit, types of work permits, roles and responsibilities of PTW signatories. (15)	BTL 6	Create	CO4
3	Describe the safety precautions to be followed during the usage of portable electric tools. (15)	BTL 5	Evaluate	CO4
4.	Summarize the preventive maintenance taken place in terms of electrical safety. (15)	BTL 6	Create	CO4
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				
Q.No.	Questions	BT Level	Competence	Course Outcome
1.	What are hazardous zones?	BTL 1	Remember	CO5
2.	Classify the types of hazardous zones each with an example	BTL 6	Create	CO5
3.	Why hazardous zones form an important factor in electrical safety?	BTL 2	Understand	CO5
4.	Explain with an example-Intrinsically safe electrical apparatus.	BTL 5	Evaluate	CO5
5.	Differentiate Explosion proof and intrinsically safe electrical apparatus	BTL 2	Understand	CO5
6.	How are electrical equipments selected for different zones?	BTL 4	Analyse	CO5
7.	What are the methods to be followed for increasing the safety for electrical equipments?	BTL 4	Analyse	CO5
8.	Identify the different classes of temperature classification.	BTL 3	Apply	CO5
9.	How are grouping of gases takes place?	BTL 1	Remember	CO5
10.	What are the challenges seen in maintaining electrical safety under hazardous zones?	BTL 1	Remember	CO5
11.	What is the aim of grouping up of gases?	BTL 3	Apply	CO5
12.	Name the components of intrinsic safety barrier	BTL 1	Remember	CO5
13.	Prepare the usage of barrier in hazardous zones	BTL 1	Remember	CO5
14.	Explain the usefulness of isolators employed in electrical hazardous zones	BTL 3	Apply	CO5
15.	Categorize the types of hazardous zones	BTL 2	Understand	CO5
16.	On what criteria the equipments are selected for different zones of hazards?	BTL 2	Understand	CO5

17.	State intrinsic safety	BTL 6	Create	CO5
18.	List out the components of explosion proof apparatus	BTL 1	Remember	CO5
19.	How temperature gets affected in these hazardous zones?	BTL 5	Evaluate	CO5
20.	Name few equipment certifying agencies.	BTL 4	Analyse	CO5
				CO5
Part – B				
1.	What are hazardous zone? Explain their classification in detail. (13)	BTL 6	Create	CO5
2.	How are electrical equipments selected for different zones? (13)	BTL 5	Evaluate	CO5
3.	i) With a neat sketch, explain intrinsically safe electrical apparatus. (6) ii) What is temperature classification? Explain its categories. (7)	BTL 2	Understand	CO5
4.	How does a temperature class prove as an important factor for its suitability in hazardous area? (13)	BTL 2	Understand	CO5
5.	Installation of cables uses intrinsically safe circuits – Justify. (13)	BTL 3	Apply	CO5
6.	i) What is the difference between intrinsically safe and flameproof equipment? (7) ii) Write a note on intrinsic safety. (6)	BTL 2	Understand	CO5
7.	Account on how electrical equipments are selected for different hazardous zones. (13)	BTL 1	Remember	CO5
8.	Elaborate on how gases or vapours get classified in a hazardous location. (13)	BTL 1	Remember	CO5
9.	(i) What is an intrinsic safety barrier? Explain its components. (7) (ii) Explain about grouping of gases. (6)	BTL 3	Apply	CO5
10.	With a neat diagram, explain explosion proof electrical apparatus. (13)	BTL 1	Remember	CO5
11.	Prepare the importance of employing barriers and isolators in electrical safety. (13)	BTL 4	Analyse	CO5
12.	Discuss the challenges to be met while selecting electrical equipment for hazardous zones. (13)	BTL 1	Remember	CO5
13.	i) How are electrical barriers used in hazardous zones? (7) ii) Brief on explosion proof electrical apparatus. (6)	BTL 4	Analyse	CO5
14.	Explain in detail on how to work in hazardous environments. (13)	BTL 4	Analyse	CO5
Part – C				
1.	Determine how hazardous zones are classified? How the temperature does get affected due to	BTL 5	Evaluate	CO5

	this zone? (15)			
2.	Differentiate intrinsic safe and explosion proof electrical apparatus with a neat diagram. (15)	BTL 6	Create	CO5
3.	Explain the barriers in protective maintenance and discuss on the use of barriers and isolators. (15)	BTL 5	Evaluate	CO5
4.	Generalize on different electrical equipment certifying agencies. (15)	BTL 6	Create	CO5

Course Outcomes:

Cos	Course Outcome
CO1	This course would make familiar of basic concepts in electrical circuit and hazards involved in it.
CO2	Course would be helpful to understand the electrical hazards in Industries.
CO3	Students would be able to understand the operation of various protection systems from electrical hazards.
CO4	Ability to acquire the knowledge on importance of earthing and selection, installation, operation and maintenance.
CO5	Recognize different hazardous zones in Industries