Registration No.....

School of Electrical Skills
Third Semester, End Semester Examination
Summer Semester, B. Voc. Program, Session: 2018-18

Course Code: ELE 1301 **Time: 3 Hours**

Course Name: Electrical Assembly Operator Control Panel **Max. Marks: 100**

Instructions: Answer all questions from section A, each question carries two marks. Answer any six questions from section B, each question carries five marks. Answer all questions from section C, each question carries ten marks. Scientific calculator can be used.

Section – A 10x2=20 Marks

Q.1 (A) For household wiring and small units, the following should be used for safety measure
(a) MCB (b) ACB (c) OCB (d) MCCB

(B) Which of the following colour is used for radiation hazard?
(a) Red (b) Orange (c) Green (d) Purple

Q.2 (A) The symbol for the Canadian Recognized Component Mark is:
(a)  (b)  (c)  (d) 

(B) The last digit of the CCN code of the UL Recognized for Canada product is:
(a) 5 (b) 6 (c) 7 (d) 8

Q.3 (A) Which of the following is not used as a generic material for use as barriers in insulators?
(a) Epoxy (b) Phenolic (c) Mica (d) Aramid paper

(B) Which of the following is a not a straight rating of power systems?
(a) Corner grounded delta (b) Ungrounded delta
(c) Grounded wye (d) Ungrounded wye

Q.4 (A) A safety transformer is used in:
(a) protective extra low voltage circuit (b) protective extra high voltage circuit
(c) protective low voltage circuit (d) protective extra high voltage circuit

(B) How many categories of STOP functions exit for control circuits?
(a) 4 (b) 3 (c) 2 (d) 1

Q.5 (A) The highest priority stop function is:
(a) Category 0 (b) Category 1 (c) Category 2 (d) None of the above

(B) The EMERGENCY STOP function does not permit this category:
(a) Category 0 (b) Category 1 (c) Category 2 (d) None of the above

Q.6 (A) In all cases where electrical voltage presents an immediate hazard the following operation is activated:
(a) Emergency OFF (b) Emergency STOP (c) Both a & b (d) None of the above

(B) Radial ventilated is a type of:
(a) Cable (b) Cable Drum (c) Insulator (d) Bus bar

Q.7 (A) AWM stands for:
(a) Aluminium Wiring Material (b) Aluminium Wiring Mesh
(c) Appliance Wiring Material (d) Appliance Wiring Mesh

(B) According to the AWM style numbering the code or multiple conductors with thermoplastic insulation is:
(a) 2xxxx (b) 3xxxx (c) 4xxxx (d) None of the above

Q.8 (A) Which of the following is not a renewable source of energy?
(a) Nuclear Energy (b) Energy from Waste (c) Hydropower (d) Biomass

(B) 'Ducts' is the other name for:
(a) Internal Raceways (b) External Raceways (c) Cables (d) none

Q.9 (A) Serial number / production number is generally a part of:
(a) Warning (b) Caution (c) Name plate (d) Notice

(B) Practical information outside the context of possible personal injury is provided in a:
(a) Danger (b) Notice (c) Warning (d) Caution

Q.10 (A) Fuse holders used in power circuit for branch circuit protection shall not be marked for:
(a) Power (b) Voltage (c) Current (d) Fuse Type

(B) An electrical outlet that connects an electrical device to an electricity supply is known as:
(a) Pin (b) Plug (c) Receptacle (d) Socket

Section – B **6x5=30 Marks**

Answer any six questions.

Q. 1. Discuss about the fuse marking on the industrial control panel acc. to UL 508A.

Q. 2. Explain the markings for all field wiring terminals in industrial control circuits.

Q. 3. Explain the nameplate specifications for a control panel using an example.

Q. 4. Discuss about the protective measures to be taken according to ISO 1210.

Q. 5. Discuss about the EMERGENCY STOP operation.

Q. 6. Explain about the types of cable drums.

Q. 7. How is the ground terminal marked in industrial control panel?

Q. 8. Explain the configuration of a configuration of a protective extra low voltage (PELV) circuit.

Section – C **5x10=50 Marks**

Q. 1. Discuss about the warning information display with the help of a flow chart.

Q. 2. Explain the START and STOP functions of control circuits.

Q. 3. What are the requirements for the proper routing of cables?

Q. 4. Discuss about the various power system configurations.

Q. 5. What are the different UL marks and discuss about them?

School of Electrical Skills
Third Semester, End Term Semester Examination
Summer Semester, B. Voc. Program, Session: 2018-18

Course Code: ELE 1301
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Solution/ Answer Key

Section – A **10x2=20 Marks**

Q.1 (A) **For household wiring and small units, the following should be used for safety measure**
(a) MCB (b) ACB (c) OCB (d) MCCB
Ans. (a)
(B) **Which of the following colour is used for radiation hazard?**
(a) Red (b) Orange (c) Green (d) Purple
Ans. (d)

Q.2 (A) The symbol for the Canadian Recognized Component Mark is:
(a) (b) (c) (d)
Ans. (c)
(B) The last digit of the CCN code of the UL Recognized for Canada product is:
(a) 5 (b) 6 (c) 7 (d) 8
Ans. (d)

Q.3 (A) Which of the following is not used as a generic material for use as barriers in insulators?
(a) Epoxy (b) Phenolic (c) Mica (d) Aramid paper
Ans. (b)
(B) Which of the following is a not a straight rating of power systems?
(a) Corner grounded delta (b) Ungrounded delta (c) Grounded wye (d) Ungrounded wye
Ans. (c)

Q.4 (A) A safety transformer is used in:
(a) protective extra low voltage circuit (b) protective extra high voltage circuit
(c) protective low voltage circuit (d) protective extra high voltage circuit
Ans. (a)
(B) How many categories of STOP functions exit for control circuits?
(a) 4 (b) 3 (c) 2 (d) 1
Ans. (b)

Q.5 (A) The highest priority stop function is:
(a) Category 0 (b) Category 1 (c) Category 2 (d) None of the above
Ans. (a)
(B) The EMERGENCY STOP function does not permit this category:
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Ans. (c)

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Ans. (a)
(B) Radial ventilated is a type of:
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Ans. (b)

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(c) Appliance Wiring Material d) Appliance Wiring Mesh
Ans. (c)
(B) According to the AWM style numbering the code or multiple conductors with thermoplastic insulation is:
(a) **2xxxx** (b) 3xxxx (c) 4xxxx (d) None of the above
Ans. (a)

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Ans. (c)
(B) Practical information outside the context of possible personal injury is provided in a:
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Ans. (b)

Q.10 (A) Fuse holders used in power circuit for branch circuit protection shall not be marked for:
(a) Power (b) Voltage (c) Current (d) Fuse Type
Ans. (a)
(B) An electrical outlet that connects an electrical device to an electricity supply is known as:
(a) pin (b) plug (c) receptacle (d) socket
Ans. (c)

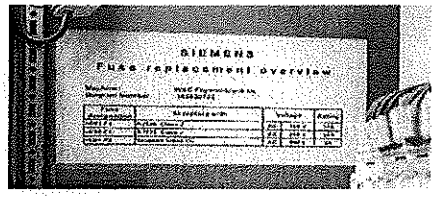
Section – B **6x5=30 Marks**

Answer any six questions.

Q. 1. Discuss about the fuse marking on the industrial control panel acc. to UL 508A
Ans:

- Fuse holders used in the power circuit for branch circuit protection shall be marked. If the fuse holder is also designed for larger fuses than the rated current of the circuit, the marking shall include details of the following:
  - **Fuse type**
  - **Voltage**
  - **Current rating**
- Fuse holders for overcurrent protection of control circuits shall always be marked with the replacement fuse.
- The marking shall be provided either immediately adjacent to the respective fuse holder, or as information on the door, or visibly inside the control panel.

Example of marking for fuse holders:



Q. 2. Explain the markings for all field wiring terminals in industrial control circuits?
Ans: All terminals in the industrial control panel used for field wiring shall be provided with the following information:

- ✓ Type of conductor material
- ✓ "Use Copper Conductors only"
- ✓ "Use Aluminium Conductors Only"
- ✓ Suitable for copper or aluminium conductors
  - "Use Copper or Aluminium Conductors" or
  - "Use Copper, Copper-Clad Aluminium or Aluminium Conductors"
- ✓ Suitable for copper or copper-clad aluminium conductors
- ✓ "Use Copper or Copper-clad Aluminium conductors"
- ✓ Permissible temperature range (applies only to terminals in the power circuit!)
  - 60 °C (140°F) for terminals with a rated current less than 100 A
  - 75 °C (167°F) for terminals with a rated current less than 100 A and approval for the 75 °C temperature range
  - 75 °C (167°F) for terminals with a rated current greater than 100 A

Q. 3. Explain the nameplate specifications for a control panel using example.

Ans:

AAA Machine Company, Anywhere, Germany	
Serial Number	12388-77
Full-load Amperes	50 Amperes
Largest Motor	2 Horsepower
Largest Heater Load	15 Amperes
Voltage, phase, freq.	460 - 480 V, 3 phase, 60 Hz
Max. short circuit current	50 kA rms symmetrical, 480 V max.
Supply fuse (field provided)	Class RK5, 600 Vac / 60 A
Enclosure Type rating	Type 1
Diagram Numbers	CM 12.1 THRU CM 12.5
Industrial Control Panel For Industrial Machinery	

Q. 4. Discuss about the protective measures to be taken according to ISO 12100?

Ans: These are technical measures using protective equipment to protect personnel against hazards or risks. Protective measures are required in the following cases:

- Hazards that cannot be adequately removed by means of inherently safe design.
- When risks cannot be sufficiently reduced.
- Further measures shall also be taken to prevent unintentional or unexpected machine movements.

Examples:

- Cancelation of a locked-off condition
- Fault in the power supply
- Battery replacement
- Loss of control signals with cable less control systems

Q. 5. Discuss about the EMERGENCY STOP operation?

Ans:

- An EMERGENCY STOP shall function as either a Category 0 or Category 1. The choice of the category of the emergency stop shall be determined by the risk assessment of the machine.
- Final removal of power to the machine actuators shall be ensured. Therefore, Category 2 is not permitted. This interruption shall be ensured by means of electromechanical components, although these do not necessarily require the properties of a disconnector.
- If electromechanical switching devices (such as magnetic motor controllers and relays) are used to meet the requirements of Category 0, for example, these shall be non-retentive relays.

Q. 6. Explain about the types of cable drums?

Ans:

- A radial-type drum is one where spiral layers of cable are accommodated between closely spaced flanges. If fitted with solid flanges, the drum is described as nonventilated; if the flanges have suitable apertures, as ventilated.
- A ventilated cylinder drum is one where the layers of cable are accommodated between widely spaced flanges and the drum and end flanges have suitable ventilating apertures.
- It is recommended that the use of derating factors be discussed with the cable and the cable drum manufacturers. This can result in other factors being used.

Q. 7. How is the ground terminal marked in industrial control panel?

Ans:

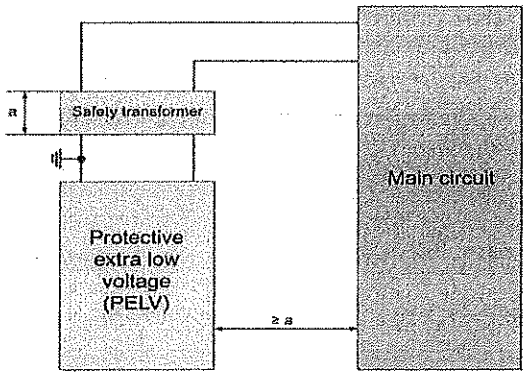
The ground terminals can be marked in the following three ways:

- The following **abbreviations** are recommended: "G", "GND", "GRD", "Ground" or "Grounding"
- "PE" (protective earth) can also be used as marking according to NFPA 79. However, this is a typical abbreviation taken from the IEC standards and does not correspond to the standard abbreviation that is currently used in North America.
- **Color:** green or green/yellow
- **Grounding symbol** according to IEC ⏚

Q. 8. Explain the configuration of a configuration of a protective extra low voltage (PELV) circuit?
Ans.

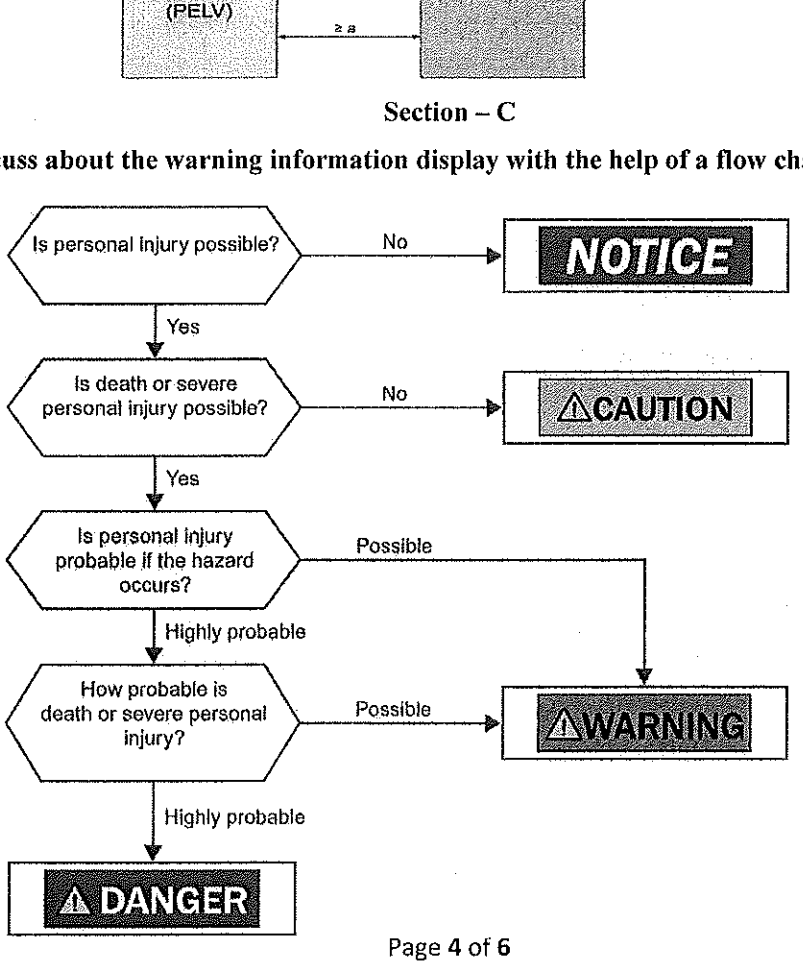
The following devices may be used for supplying a PELV:

- Safety transformer (isolation transformer!)
- Current source providing a degree of safety equivalent to that of a safety transformer (e.g. motor generator with insulated windings).
- Electrochemical sources (e.g. batteries) or another source independent of a higher-voltage circuit (e.g. diesel-driven generators).
- Electronic power supply with fused outputs. An internal fault is not permitted to result in excess voltage in accordance with the PELV standard voltages.



Section – C **5x10=50 Marks**

Q. 1. Discuss about the warning information display with the help of a flow chart.
Ans:



Q. 2. Explain the START and STOP functions of control circuits.

Ans:

- **Start functions**
  - Start functions shall operate by energizing the relevant circuit.
  - This means that a device (such as a converter/drive, magnetic motor controller or circuit breaker) is activated by the generation of a signal.
  - Interrupting a signal in order to activate a start function is not permitted.
- **Stop functions**
  - Stop functions shall operate by de-energizing that relevant circuit, and shall override related start functions.
  - The reset of the stop functions shall not initiate any hazardous conditions.
  - **NFPA 79** defines three different categories for controlling electrical actuators with the aim of stopping them.
  - These categories do not make a distinction between an emergency measure (EMERGENCY STOP) and an operational measure (e.g. service and maintenance).
  - In addition, the 0, 1, and 2 classifications do not denote any particular priority or rank. As a result, the stopping process shall always be carried out for the entire actuator, not just the electrical part of the equipment.

Category	Aspects		
	Energy supply	**Delay**	**Stopping**
Category 0 stop	Immediate interruption	Uncontrolled	No control
Category 1 stop	Interruption once the specified position is Reached	Controlled delay via the control system	No control
Category 2 stop	No interruption	Controlled delay via the control system	Ensured by the actuator control system

Q. 3. What are the requirements for the proper routing of cables?

Ans:

- Exposed cables are permitted if they are installed along the structure of the machine or the chases of the machinery. Exposed cables shall be installed to closely follow the structural members of the machinery.

Cables shall be supported as follows:

- In such a manner that the cable will not be damaged by normal equipment use.
  - Every 305 mm (12 in.) in a non-vertical run.
- **Exception:** The supporting distance may be increased up to 914 mm (36 in.) if the structure of the machine or system makes support impractical every 305 mm (12 in.).
  - Every 914 mm (36 in.) in a non-vertical run.
- **Exception:** The supporting distance may be increased up to 2.44 m (96 in.) if the structure of the machine or system makes support impractical every 914 mm (36 in.).
  - When suspended in air spanning a distance of 457 mm (18 in.).
- **Exception:** The span distance may be increased up to 914 mm (36 in.) if the structure of the machine or system makes support impractical every 457 mm (18 in.).

Q. 4. Discuss about the various power system configurations?

Ans:

Slash rating

- A "slash rating" refers to a solidly grounded wye. The following two voltages occur in such a power system:
  - "Phase-to-phase"
  - "Phase-to-ground"
- Both voltages are specified in the case of a "slash rating". For example:
  - 208Y/120V, 240Y/131V, 480Y/277V, 600Y/347V
- The term "slash rating" refers to the slash used.
- The most frequently found industrial power system in the USA is the 480Y/277V system.

In the case of a "slash rating", the first single-pole short- circuit on phase-to-ground voltage (e.g. 277 V on a 480Y/277V power system) is switched. This means the protective devices used shall be approved **at least** for the phase-to-ground voltage.

Straight rating

- A "straight rating" refers to power systems other than a solidly grounded wye.
- Only one voltage occurs in such power systems. The phase-to-phase voltage and the phase-to-ground voltage are equal in size if present.
- Such power systems can include:
  - Delta systems, grounded or ungrounded
  - Ungrounded wye systems
- If a "straight rating" is present, only one voltage will consequently be specified. For example:
  - 240 V, 480 V, 600 V

Delta system, grounded and ungrounded 480 V, ungrounded wye system 480 V

- With a "straight rating, the short circuit is switched at full voltage (e.g. 480 V or 600 V). This means the protective devices used shall be approved at least for this.

Other power supply system configurations

- The "midpoint grounded delta" is found more rarely.
- With this system, grounding is carried out between the phases, with the result that the short circuit is switched at "high leg voltage". This is 208 V in the case of a 240 V midpoint grounded delta.
- This means the protective devices used shall be able to disconnect the short-circuit at 208 V.

Q. 5. What are the different UL marks and discuss about them?
Ans.

Mark	Applications
	**UL Listing Mark**: This is one of the most common UL Marks. Products carrying this mark (e.g. washing machines, computers, electrical control panels, fire extinguishers, life belts, etc.) meet all UL safety re-quirements and can be installed universally, without further instructions, and without restrictions on the relevant applicability. The Siemens portfolio, for example, offers contactors in accordance with UL 508 or circuit breakers in accordance with UL 489.
	**C-UL Listing Mark:** This mark is applied to products for the Canadian market. The products with this type of mark have been evaluated to Canadian safety requirements, which may be somewhat different from U.S. safety requirements. You will see this type of Mark on appliances and computer equipment, vending machines, household burglar alarm systems, lighting fixtures, and many other types of products.
	**C-UL-US Listing Mark:** UL introduced this new Listing Mark in early 1998. It indicates compliance with both Canadian and U.S. requirements. The Canada/US UL Mark is optional. UL encourages those manufactur-ers with products certified for both countries to use this new, combined Mark, but they may continue using separate UL Marks for the United States and Canada.
	**Recognized Component Mark:** This mark is used on components or devices used in machinery, systems or products, such as washing machines. These components may have restrictions on their performance or may be incomplete in construction. The Recognized Component Mark is found on a wide range of prod-ucts, including switches, power supplies, printed circuit boards, some kinds of industrial control equipment, and many other products. They shall only be installed by experts, as the "Conditions of Acceptability" (CoA) apply to these devices. The UR Mark is carried, for example, by Siemens miniature circuit breakers according to UL 1077, Siemens time switches according to UL 917, and SITOR fuses.
	**Canadian Recognized Component Mark**: Similar as the Recognized Component mark - see above): Prod-ucts intended for Canada carry the Recognized Component mark "C".
	**Recognized Component Mark for Canada and the United States**: This new UL Recognized Component Mark, which became effective April 1, 1998, may be used on components certified by UL to both Canadian and U.S. requirements. Although UL had not originally planned to introduce a combined Recognized Com-ponent Mark, the popularity of the Canada/US Listing and Classification Marks among clients has led to the new Mark.

Certifications such as  and  are issued by the NRTLs (Nationally Recognized Testing Laboratories) after successful testing. OSHA has accredited Underwriters Laboratories as an NRTL.

Registration No.....

School of Electrical Skills
Third Semester, End Semester Examination
B. Voc. Program, Summer Semester, (Session: 2018-19)

Course Code: ELE 1302 **Time: 3 Hours**
Course Name: Electrical Design Developer **Max. Marks: 100**

Instructions: Answer all questions from section A, each question carries two marks. Answer any six questions from section B, each question carries five marks. Answer all questions from section C, each question carries ten marks. Scientific calculator can be used.

Section – A **10x2=20 Marks**

Q.1. (A) What is the purpose of blades in the squirrel cage induction motor?
(a)To cool the rotor (b) To reduce electrical resistance of rotor cage
(c) To balance the motor (d) All of these

(B) The shaft of an induction motor is made of:
(a) Stainless steel (b) Carbon steel (c) Cast iron (d) Aluminium

Q.2. (A) The allowable flux density in CRGO steel is around:
(a) 1.7 Wb/m^2 (b) 2.7 Wb/m^2 (c) 3.7 Wb/m^2 (d) 4.7 Wb/m^2

(B) F=BIL can only be used if electric current and magnetic field are:
(a) in same direction (b) anti-parallel to each other
(c) anti-parallel to each other (d) at right angles to each other

Q.3. (A) Number of field lines passing at certain area are known as:
(a) Electric field (b) electric flux (c) electrostatics (d) electric field lines

(B) What is the total installed capacity of capacitor banks in BSDU?
(a) 100kVAr (b) 300 kVAr (c) 400 kVAr (d) 450kVAr

Q.4. (A) If DC supply is given to the transformer it may:
(a) work (b) not work
(c) give lower voltage than rated voltage on secondary (d) burn the winding

(B) EMF induced in the secondary winding depends upon
(a) Number of turns (b) flux (c) supply frequency (d) All of these

Q.5. (A) A transformer operates
(a) Has its own power factor (b) At power factor depending on the power factor of the load
(c) Always at unity power factor (d) At a power factor below a particular value

(B) The relation between rotor frequency f2 slip s, and stator frequency f1 is given by
(a) $f_2 = f_1/s$ (b) $f_2 = sf_1$ (c) $f_2 = (1-s)f_1$ (d) None of these

Q.6. (A) The laminations are made from
(a) Silicon sheet steel (b) Nickel alloy steel stamping
(b) Low carbon steel (d) Chrome steel sheets

(B) What does the data 950V/1030 A given on the name plate of induction motor represent:
(a) 950V: The lowest stator voltage
(b) 950V: The voltage across two short circuited sliprings
(c) 950V: The voltage across two short circuited sliprings when motor is stationary
(d) 1030A: Current drawn from the circuit at rated load.

Q.7. (A) Transformer works on the principle of:
(a) Self and mutual induction (b) Mutual induction
(b) Faradays' law of electromagnetic induction (d) Self induction

(B) At every instant, the direction of secondary current in a transformer must be such as to oppose any change in flux. This is in accordance with:

(a) Faraday's Law (b) Lenz's Law (c) Joule's law (d) Coulomb's Law

Q.8. (A) Which of the following is not a part of transformer installation?

(a) Conservator (b) Breather (c) Buchholz Relay (d) Exciter

(B) Which of the following is not a part of a squirrel cage induction motor?

(a) Rotor (b) Stator (c) Carbon brushes (d) Shaft

Q.9. (A) Material used for construction of transformer core is usually:

(a) Wood (b) Copper (c) Aluminium (d) Silicon steel

(B) Class B insulation can withstand a maximum temperature of:

(a) 120^0C (b) 130^0C (c) 105^0C (d) 135^0C

Q.10. (A) Why there is an enamel layer coated over the laminations of the transformer core?

(a) To decrease the hum (b) To insulate the laminations against each other
(c) To attain adhesion between laminations (d) To prevent the corrosion of the laminations

(B) Which type of circuit breaker is used in BSDU control panel?

(a) Oil circuit breaker (b) SF6 circuit breaker (c) Air circuit breaker (d) All of these

Section – B 6x5=30 Marks

Answer any six questions.

Q. 1. Consider a coil having turns (N)=25. The toroid, on which the coil is wound, has an inside diameter of 5cm and outside diameter of 5.5cm. For current (i)= 5A, calculate the magnetic field intensity.

Q. 2. Describe Ampere's law with a neat sketch.

Q. 3. What are the different types of losses occur in a three phase induction motor. Give relevant information with a neat sketch.

Q. 4. Derive the electromotive force expression of single phase transformer.

Q. 5. An 8-pole, 3-phase, 60 Hz, star connected induction motor has a slip of 5%. Calculate full load speed of motor.

Q. 6. Derive the magnetic flux relation considering air gaps in magnetic structures.

Q. 7. The primary winding of a 50 Hz single phase transformer has 480 turns and is fed from 5400 V supply. The secondary winding has 20 turns. Find the peak value of the flux in the core and the secondary voltage.

Q. 8. A 208-V, 10hp, four pole, 60 Hz, Y-connected induction motor has a full-load slip of 5 percent. Calculate rotor speed and rotor frequency at rated load.

Section – C 5x10=50 Marks

Q. 1. Briefly explain the distribution factor and pitch factor and damper winding of an alternator. Also derive the EMF equation of alternator.

Q. 2. Explain the single line diagram of BSDU by explaining all components with a neat sketch in detail.

Q. 3. In the transformer, all flux lines in the core are assumed to cross the air gap. The structure dimensions are as follows: cross sectional area (A_m)= 20cm^2, mean path length (l_m)= 40cm, l_g= 2mm, and N=75 turns. In the linear region, the core permeability is assumed to be constant, with μ_r =4500. The coil current (i)= 30A. is below the saturation level. Calculate the flux density in the air gap (a) including the reluctance of the core as well as that of the air gap (b) ignoring the core reluctance in comparison to the reluctance of the air gap. On what principle induction motor works? What are the main parts of the motor? Explain briefly slip in the induction motor.

Q. 4. With a neat diagram explain the working principle of a single phase transformer.

Q. 5. Derive the formula for per unit current and per unit impedance.

School of Electrical Skills

First Semester, End Term Semester Examination

Summer Semester, B. Voc. Program, Session: 2018-19

Course Code: ELE1302

Course Name: Electrical Design Developer **Max. Marks: 100**

Solution/ Answer Key

Section – A 10x2=20 Marks

Q.1. (A) What is the purpose of blades in the squirrel cage induction motor

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(c) To balance the motor
(d) All of these

(B) The shaft of an induction motor is made of

(a) Stainless steel
(b) Carbon steel
(c) Cast iron
(d) Aluminium

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(c) supply frequency (d) All of these

Q.5. (A) A transformer operates

(a) Always at unity power factor
(b) At power factor depending on the power factor of the load
(c) Has its own power factor
(d) At a power factor below a particular value

(B) The relation between rotor frequency f2 slip s, and stator frequency f1 is given by

(a) $f_2 = f_1/s$ (b) $f_2 = sf_1$ (c) $f_2 = (1-s)f_1$ (d) None of these

Q.6. (A) The laminations are made from

(a) Silicon sheet steel

(b) Nickel alloy steel stamping

(c) Low carbon steel

(d) Chrome steel sheets

(B) What does the data 950V/1030 A given on the name plate of induction motor represent

(a) 950V: The lowest stator voltage

(b) 950V: The voltage across two short circuited sliprings

(c) 950V: The voltage across two short circuited sliprings when motor is stationary

(d) 1030A: Current drawn from the circuit at rated load.

Q.7. Transformer works on the principle of

(a) Self and mutual induction

(b) Mutual induction

(c) Faradays's law of electromagnetic induction

(d) Self induction

(B) At every instant, the direction of secondary current in a transformer must be such as to oppose any change in flux. This is in accordance with

(a) Faraday's Law (b) Lenz's Law (c) Joule's law (d) Coulomb's Law

Q.8. (A) Which of the following is not a part of transformer installation

(a) Conservator (b) Breather (c) Buchholz Relay (d) Exciter

(B) Which of the following is not a part of a squirrel cage induction motor

(a) Rotor (b) Stator (c) Carbon brushes (d) Shaft

Q.9. (A) Material used for construction of transformer core is usually:

(a) Wood (b) Copper
(c) Aluminium (d) Silicon steel

(B) Class B insulation can withstand a maximum temperature of

(a) 120^0C (b) 130^0C (c) 105^0C (d) 135^0C

Q.10. (A) Why there is an enamel layer coated over the laminations of the transformer core

(a) To decrease the hum
(b) To attain adhesion between laminations
(c) To insulate the laminations against each other

(d) To prevent the corrosion of the laminations

(B) Which type of circuit breaker is used in BSDU control panel

(a) Oil circuit breaker
(b) SF6 circuit breaker
(c) Air circuit breaker
(d) All of these

Section – B **6x5=30 Marks**

Answer any six questions.

Q. 1. Consider a coil having turns (N)=25. The toroid, on which the coil is wound, has an inside diameter of 5cm and outside diameter of 5.5cm. For current (i)= 5A, calculate the magnetic field intensity?

Ans 1: $H=Ni/l_m$

$l_m= 2*3.14*r_m$

$r_{m=}$ (outer diameter+ inner diameter)/2

H= (25*5)/0.0525

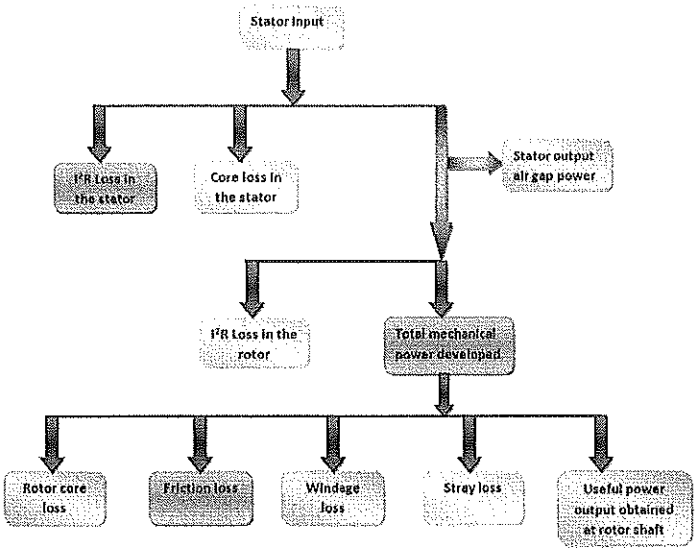
H= 2380.95 A/m

Q. 2. Describe Ampere's law with neat sketch.

Ans 2: The full version of Ampere's Law is one of Maxwell's Equations that describe the electromagnetic force. Ampere's Law specifically says that the magnetic field created by an electric current is proportional to the size of that electric current with a constant of proportionality equal to the permeability of free space. Stationary charges produce an electric field proportional to the magnitude of the charge. But moving charges produce magnetic fields proportional to the current (charge and movement).

Q. 3. What are the different types of losses occur in a three phase induction motor. Give relevant information with neat sketch.

Ans 3: The input power given to an Induction motor is in the form of three-phase voltage and currents. The Power Flow Diagram of an Induction Motor is shown below.



Q. 4. Derive the electromotive force expression of single phase transformer?

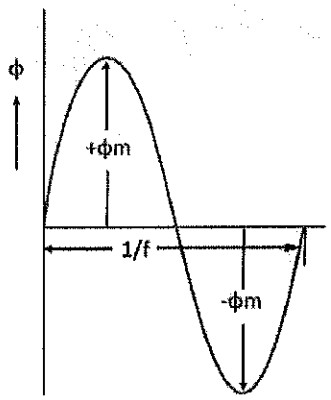
Ans 3: When a sinusoidal voltage is applied to the primary winding of a transformer, alternating flux ϕm sets up in the iron core of the transformer. This sinusoidal flux links with both primary and secondary winding. The function of flux is a sine function. The rate of change of flux with respect to time is derived mathematically.

As shown in the below figure that the flux changes from + ϕm to – ϕm in half a cycle of 1/2f seconds.

By Faraday's Law

Let E_1 is the emf induced in the primary winding

$$E_1 = -\frac{d\psi}{dt} \ldots\ldots\ldots (1)$$



Where $\Psi = N1\phi$

Therefore, $E_1 = -N_1 \frac{d\varphi}{dt}$ .....(2)

Since ϕ is due to AC supply $\phi = \phi m \sin wt$

$$E_1 = -N_1 \frac{d}{dt} (\varphi_m \, Sinwt)$$

$$E_1 = -N_1 \, w\varphi_m \, Coswt$$

$$E_1 = N_1 \, w\varphi_m \, Sin(wt - \pi/2) \ldots\ldots\ldots (3)$$

Maximum valve of emf

$$E_1 max = N_1 \, w\varphi_m \ldots\ldots\ldots (4)$$

$$E_1 max = 2\pi f N_1 \varphi_m \ldots\ldots\ldots (5)$$

$$E_1 = \frac{E_{1max}}{\sqrt{2}} \ldots\ldots\ldots (6)$$

$$E_1 = \sqrt{2}\pi f N_1 \varphi_m \ldots\ldots (7)$$

$$E_1 = 4.44 f N_1 \varphi_m \ldots\ldots\ldots (8)$$

$$E_2 = \sqrt{2}\pi f N_2 \varphi_m$$

Or

$$E_2 = 4.44 f N_2 \varphi_m \ldots\ldots\ldots (9)$$

Q. 5. An 8-pole, 3-phase, 60 Hz, star connected induction motor has a slip of 5%. Calculate full load speed of motor.

Sol 5: In Induction Motor,

Speed Ns=(120* frequency)/(No.of poles)

Speed Ns= (120*60)/8=900 rpm.

So the slip S= (Ns-N)/Ns
0.05= (900-N)/900

N= 855 rpm

Q. 6. Derive the magnetic flux relation considering air gaps in magnetic structures?

Ans 6: Separate sheet attached

Q. 7. The primary winding of a 50 Hz single phase transformer has 480 turns and is fed from 5400 V supply. The secondary winding has 20 turns. Find the peak value of the flux in the core and the secondary voltage.

Sol 7:

V1/V2=N1/N2
5400/V2= 480/20
V2= 225 turns

$E= 4.44fN\Phi_{Max}$

$\Phi_{Max}= E/4.44fN$
$\Phi_{Max}= 5400/4.44*50*480= 0.050Wb$

Q. 8. A 208-V, 10hp, four pole, 60 Hz, Y-connected induction motor has a full-load slip of 5 percent. Calculate rotor speed and rotor frequency at rated load.

Ans 8: Speed Ns=(120* frequency)/(No.of poles)
Speed Ns= (120*60)/4=180 rpm
So the slip S= (Ns-N)/Ns

(1-0.05)*1800= 1710 rpm.
Fr=sfs
Fr= 0.05*60= 3 Hz.

Section – C **5x10=50 Marks**

Q. 1. Briefly explain the distribution factor and pitch factor and damper winding of an alternator. Also derive the EMF equation of alternator.

Ans 1: The Distribution Factor or the Breadth Factor is defined as the ratio of the actual voltage obtained to the possible voltage if all the coils of a polar group were concentrated in a single slot. It is denoted by Kd

Pitch factor is the measure of resultant emf of short pitched coil in comparison with resultant emf of full pitched coil. Hence, it must be the ratio of phasor sum of induced emfs per coil to the arithmetic sum of induced emfs per coil.

Damper winding in an alternator is also known as squirrel cage winding. This winding is located inside the slotted pole shoes of alternator. A damper winding has a crucial role in alternator as it prevent hunting (momentarily speed fluctuations) in alternator.

Q. 2. Explain the single line diagram of BSDU by explaining all components with neat sketch in detail.

Ans 2:

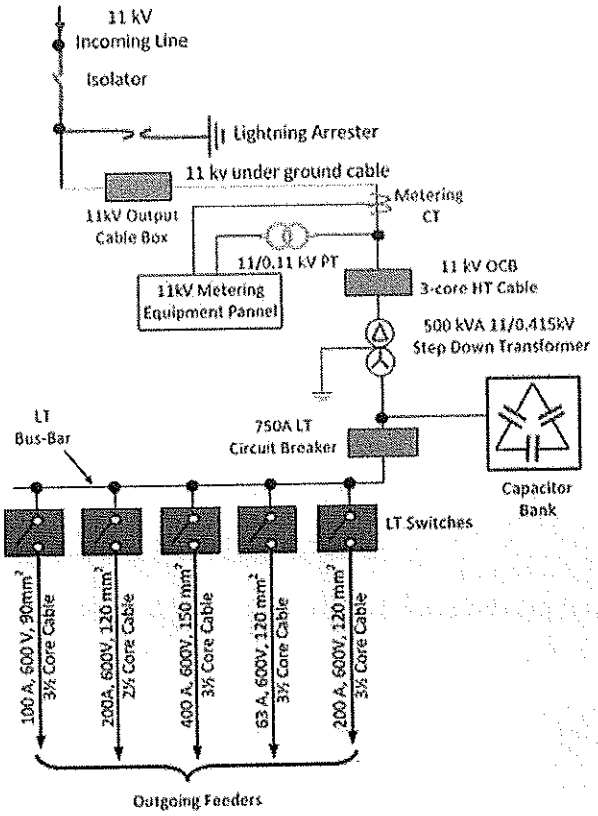
Isolator – The isolator connects or disconnects the incoming circuit when the supply is already interrupted. It is also used for breaking the charging current of the transmission line. The isolator is placed on the supply side of the circuit breaker so that the circuit breaker isolated from the live parts of the maintenance.

Lightning Arrester – The lightning arrester is a protective device which protects the system from lightning effects. It has two terminals one is high voltage and the other is the ground

voltage. The high voltage terminal is connected to the transmission line and the ground terminal passes the high voltage surges to earth.

CT Metering – The metering CT measure and records the current when their secondary terminal is connected to the metering equipment panel.
Step-down Transformer – The step-down transformer converts the high voltage current into the low voltage current.

Capacitor Bank – The capacitor bank consists series or parallel connection of the capacitor. The main function of the capacitor bank is to improve the power factor of the line. It draws the leading current to the line by reducing the reactive component of the circuit.

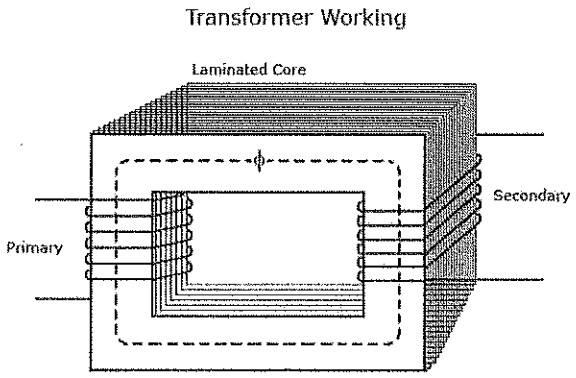


Q. 3. In the transformer, all flux lines in the core are assumed to cross the air gap. The structure dimensions are as follows: cross sectional area (A_m)= 20cm^2, mean path length (l_m)= 40cm, l_g= 2mm, and N=75 turns. In the linear region, the core permeability is assumed to be constant, with μ_r =4500. The coil current (i)= 30A. is below the saturation level. Calculate the flux density in the air gap (a) including the reluctance of the core as well as that of the air gap (b) ignoring the core reluctance in comparison to the reluctance of the air gap. On what principle induction motor works? What are the main parts of the motor? Explain briefly slip in the induction motor.

Ans 3: Separate sheet attached

Q. 4. With neat diagram explain the working principle of a single phase transformer.

Ans 4: The main principle of operation of a transformer is mutual inductance between two circuits which is linked by a common magnetic flux. A basic transformer consists of two coils that are electrically separate and inductive, but are magnetically linked through a path of reluctance. The working principle of the transformer can be understood from the figure below.



As shown above the electrical transformer has primary and secondary windings. The core laminations are joined in the form of strips in between the strips you can see that there are some narrow gaps right through the cross-section of the core. These staggered joints are said to be 'imbricated'. Both the coils have high mutual inductance. A mutual electro-motive force is induced in the transformer from the alternating flux that is set up in the laminated core, due to the coil that is connected to a source of alternating voltage. Most of the alternating flux developed by this coil is linked with the other coil and thus produces the mutual induced electro-motive force. The so produced electro-motive force can be explained with the help of Faraday's laws of Electromagnetic Induction as

$e=M*dI/dt$

If the second coil circuit is closed, a current flows in it and thus electrical energy is transferred magnetically from the first to the second coil.

The alternating current supply is given to the first coil and hence it can be called as the primary winding. The energy is drawn out from the second coil and thus can be called as the secondary winding.

Q. 5. Derive the formula for per unit current and per unit impedance.

Ans 5:

The per unit value of any quantity is defined as the ratio of actual value in any unit and the base or reference value in the same unit.

Any quantity is converted into per unit quantity by dividing the numeral value by the chosen base value of the same dimension.

The per unit value are dimensionless.

Base voltage = reference voltage of the machine
Base current = reference current of the machine
Base impedance = base voltage /base current
Base power = base voltage x base current

$$\text{Per Unit Value} = \frac{\text{Actual value in any unit}}{\text{Base or reference value in the same unit}}$$

$$Z_B = \frac{V_B}{I_B} \qquad \text{Per Unit KV} = \frac{\text{Actual KV}}{\text{Base KV}} = \frac{KV_{actual}}{KV_B}$$

$$\text{Base current } I_B = \frac{\text{Base KVA}}{\text{Base KV}} = \frac{KVA_B}{KV_B} \ldots\ldots\ldots\ldots (1)$$

$$\text{Per unit current } I_{pu} = \frac{\text{Actual value of current}}{\text{Base current}} \ldots\ldots\ldots\ldots (2)$$

Putting the value of base current from the equation (1) in equation (2) we get

$$\text{Per unit current } I_{pu} = \frac{\text{Actual value of current}}{KVA_B/KV_B}$$

$$\text{Per unit current } I_{pu} = \frac{\text{Actual value of current x } KV_B}{KVA_B}$$

$$\text{Base impedance } Z_B = \frac{\text{Base KV x 1000}}{\text{Base current}} \ldots\ldots\ldots\ldots (3)$$

Putting the value of base current from the equation (1) in the equation (3) we get

$$\text{Base impedence } Z_B = \frac{KV_B \times 1000}{KVA_B / KV_B}$$

$$\text{Base impedence } Z_B = \frac{(KV_B)^2 \times 1000}{KVA_B} \ldots\ldots\ldots (4)$$

$$\text{Base Power} = KVA_B$$

Now

$$Z_{pu} = \frac{\text{Actual Impedence}}{\text{Base impedence}} \ldots\ldots\ldots (5)$$

Putting the value of base impedance from the equation (4) in the equation (5) we will get the value of impedance per unit

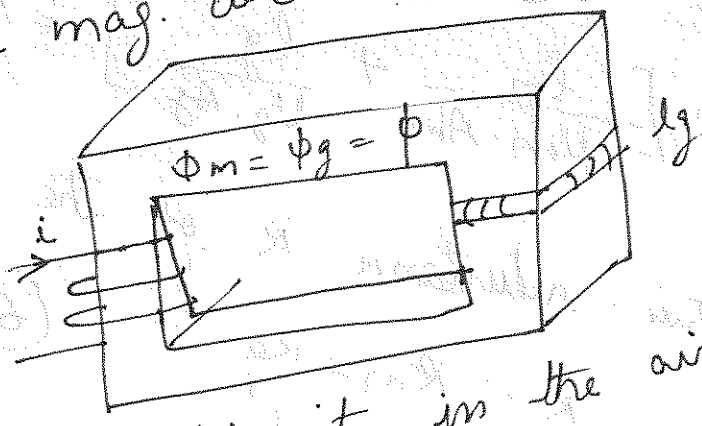
$$Z_{pu} = \frac{\text{Actual Impedence} \times KVA_B}{(KV_B)^2 \times 1000}$$

Section B

Sol 6

Ans 6. Mag. Circuits with Air Gaps

- In the mag. structures of electrical m/c, the flux lines have to cross two air gaps.
- To study the effect of air gaps, let us consider simple mag. structures which consists of N turns coil on a magnetic core made up of iron.
- The objective is to establish a desired magnetic field in the air gap of length lg.
- We assume mag. field intensity Hm to be uniform along the mean path length lm. in the mag. core.



- The mag. field intensity in the air gap is denoted by Hg.
- From Ampere laws,

$$H_m l_m + H_g l_g = Ni \quad \text{— (1)}$$

Flux density (B), corresponding to H_g & H_m are

$$B_m = \mu_m H_m \quad \& \quad B_g = \mu_g H_g$$

$$\frac{B_m}{\mu_m} = H_m, \qquad \frac{B_g}{\mu_g} = H_g \quad -(2)$$

$$\therefore \frac{B_m}{\mu_m} l_m + \frac{B_g}{\mu_g} l_g = Ni \quad -(3)$$

Since flux line form closed path, the flux crossing any $\perp$ cross sectional area

$$\phi = A_m \cdot B_m = A_g \cdot B_g$$

$$B_m = \frac{\phi}{A_m}, \quad B_g = \frac{\phi}{A_g} \quad -(4)$$

Substitute eq (4) into eq (3)

$$\phi \left[\frac{l_m}{\mu_m \cdot A_m} + \frac{l_g}{\mu_g \cdot A_g} \right] = Ni \quad -(5)$$

The effective reluctance R of the whole.

$$R = R_m + R_g \quad -(6)$$

Section C

Ans 3.

Sol 3

$$R_m = \frac{l_m}{\mu_0 \cdot \mu_{r1} \cdot A_m} = \frac{40 \times 10^{-2}}{4\pi \times 10^{-7} \times 4500 \times 20 \times 10^{-4}}$$

$$R_m = 3.54 \times 10^4 \ A/Wb.$$

$$R_g = \frac{l_g}{\mu_0 \cdot A_g} = \frac{2 \times 10^{-3}}{4\pi \times 10^{-7} \times 20 \times 10^{-4}}$$

$$R_g = 79.57 \times 10^4 \ A/Wb.$$

(a) Including both reluctances

$$\phi_g = \frac{Ni}{R_m + R_g}$$

$$\therefore B_g = \frac{\phi_g}{A_g}$$

$$B_g = \frac{Ni}{(R_m + R_g) A_g}$$

$$= \frac{75 \times 30}{(3.54 \times 10^4 + 79.57 \times 10^4) \times 20 \times 10^{-4}}$$

$$B_g = 1.35 \ T$$

(b) Neglecting core reluctance

$$\phi_g = \frac{Ni}{R_g \cdot A_g}$$

$$= \frac{75 \times 30}{(79.57 \times 10^4 \times 20 \times 10^{-4})}$$

$$\phi_g = 1.41\ T.$$

Registration No. _____

School of Electrical Skills
Third Semester, End Semester Examination
B. Voc. Program, Summer Semester, (Session: 2018-19)

Course Code: ELE 1303 **Time: 3 Hours**

Course Name: Safety Electrical Installation Controller **Max. Marks: 100**

Instructions: Answer all questions from section A, each question carries two marks. Answer any six questions from section B, each question carries five marks. Answer all questions from section C, each question carries ten marks. Scientific calculator can be used.

Section – A **10xx2=20 Marks**

Q.1. (A) All medium voltage equipment should be earthed by:
(a) Two separate and distinct connections (b) One connection only
(c) No need of earthing (d) None of these

(B) Each stay wire should be earthed unless:
(a) A insulator has been placed in it at a height not less than three meters from the ground
(b) A insulator has been placed in it at a height not less than one meters from the ground
(c) A insulator has been placed in it at a height not less than five meters from the ground
(d) None of the above

Q.2. (A) Minimum clearance between lines (in meters) when crossing 220 kV and 11 kV lines:
(a) 4.8 meters (b) 7.94 meters (c) 3.05 meters (d) 2.44 meters

(B) Clearance above the ground of the lowest overhead conductor of 11 kV lines in the field:
(a) 4.6 meters (b) 5.8 meters (c) 6.1 meters (d) None of these

Q.3. (A) If you want to do the maintenance of transformer in 132 kV switch yard then which sequence of operation to be followed for isolator and breaker:
(a) First open the isolator then trip the breaker (b) First trip the breaker then open the isolator
(c) Both should be opened simultaneously (d) None of these operation required

(B) When current is flowing in the primary of current transformer then secondary should never be kept:
(a) Open (b) short circuited (c) No load to be connected (d) None of these

Q.4. (A) Potential transformer secondary should never be:
(a) Shorted (b) To be kept open (c) both a and b (d) None of the above

(B) When making electrolyte for storage batteries always we must pour:
(a) Acid in to water (b) Water in to acid
(c) Both simultaneously (d) None of these

Q.5. (A) When working with ladders for maintenance work then ladders should be kept at an angle of:
(a) 75 degree (b) 60 degree (c) 45 degree (d) 90 degree

(B) Portable fire extinguishers' performance and construction specifications to be followed as per:
(a) IS 15683 (b) IS 325 (c) IS 1164 (d) None of these

Q.6. (A) The written intimation of a fatal accident to be reported to the electrical inspector after the occurrence within:
(a) 48 hours (b) 72 hours (c) 1 week (d) 1 month

(B) Remove the patient from the live source of accident by:
(a) Wooden stick (b) Iron road (c) Holding him directly (d) none of these

Q.7. (A) TQM stands for:
(a) Total quality management (b) Total quality material
(c) Total quality manpower (d) None of these

(B) The first-aid boxes to be updated:
(a) After three months (b) After six months (c) After 1 Year (d) Time to time

Q.8. (A) The earthing resistance of power system should be less than:
(a) Two ohms (b) Five ohms (c) 10 ohms (d) 20 ohms

(B) The earthing resistance of electronic system should be less than:
(a) One ohm (b) Two ohms (c) Three ohms (d) Five ohms

Q.9. (A) 11kV cables should be laid below ground level at a minimum depth of:
(a) One meter (b) Two meters (c) Three Meters (d) None of these

(B) The danger boards are always being provided for unsafe:
(a) Voltage (b) Current (c) Power (d) Power factor

Q.10. (A) If the power factor of a circuit is unity, its reactive power is:
(a) Zero (b) Unity (c) Maximum (d) Minimum

(B) Switch board is fixed at a height of:
(a) 1.5 metres (b) 2 metres
(c) 4 metres (d) 3 metres

Section – B

6x5=30 Marks

Answer any six questions.

Q.1. Why the extreme care to be taken when breaking an inductive circuit?
Q.2. Why is smoking prohibited in the battery rooms?
Q.3. Why the secondary circuit of current transformer should be connected to the ground at all times when the transformer is in service?
Q.4. Why the low voltage winding of potential transformer should always have one side permanently and effectively grounded?
Q.5. Despite of switching off the capacitor bank, why it is necessary to ground all the terminals of capacitor bank for its maintenance?
Q.6. What is the function of lightning arrestor?
Q.7. What is the purpose of permit to work system?
Q.8. What do you understand by the term used as "Dead Circuit"?

Section – C

10x5=50 Marks

Answer all the questions.

Q.1. Write the safety instructions which have to be followed when working on a transformer.
Q.2. Write the steps which you will take when working on instrument transformers.
Q.3. Which fire Extinguisher types are used for each class of fire and how to operate a CO_2 fire extinguisher?
Q.4. Explain in detail the philosophy of 5S. How it is useful for improving efficiency or quality in work place?
Q.5. Write the First – Aid steps to be taken to reduce the suffering of the patient after an electrical accident until the doctor arrives.

School of Electrical Skills

Third Semester, End Semester Examination

B. Voc. Program, Summer Semester, (Session: 2018-19)

Course Code: ELE 1303 **Time: 3 Hours**

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Answer Key/ Solution

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(c) A insulator has been placed in it at a height not less than five meters from the ground

(d) None of the above

Ans. (a)

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(c) Both should be opened simultaneously

(d) None of these operation required

Ans. (b)

(B) When current is flowing in the primary of current transformer then secondary should never be kept:

(a) Open (b) short circuited (c) No load to be connected (d) None of these

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Ans. (a)

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Ans. (a)

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(c) After 1 Year (d) Time to time

Ans. (d)

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Ans. (a)

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(a) One meter (b) Two meters (c) Three Meters (d) None of these

Ans. (a)

(B) The danger boards are always being provided for unsafe:

(a) Voltage (b) Current (c) Power (d) Power factor

Ans. (a)

Q.10. (A) What should be the minimum clearance in front of the main power panels?

(a) 0.5 meter (b) 1 meter

(c) 2 meters (d) 3 meters

Ans. (a)

(B) Switch board of light to be fixed at a height of:

(a) 1.5 metres (b) 2 metres

(c) 4 metres (d) 3 metres

Ans. (a)

Section – B **6x5=30 Marks**

Answer any six questions.

Q.1. Why the extreme care to be taken when breaking an inductive circuit?

Ans. The breaking time should be minimum to avoid the continuous persisting of arc. If arc persist for more time it will damage the contacts of the breaker

Q.2. Why is smoking prohibited in the battery charging areas?

Ans. Smoking is prohibited in battery charging areas because at certain points during the charging process, batteries emit a highly flammable combination of hydrogen and oxygen.

Q.3. Why the secondary circuit of current transformer should be connected to the ground at all times when the transformer is in service?

Ans. If by mistake the secondary of current transformer gets open then there will be high voltage across the secondary winding which can damage the CT as well as can harm human beings. Therefore, we have to ground the secondary of CT.

Q.4. What do you understand by low, medium, high and extra high voltage?

Ans. Low voltage less than or equal 250 volts, medium voltage less than or equal 650 volts, high voltage less than or equal 33 kV and extra high voltage more than 33 kV.

Q.5. Despite of switching off the capacitor bank, why it is necessary to ground all the terminals of capacitor bank for its maintenance?

Ans. Capacitors takes time to discharge even after switching off the capacitor bank. Therefore, it is essential to ground all the terminals of capacitor bank for its maintenance for the safety of electricians.

Q.6. What is the function of lightning arrestor?

Ans. The function of lightning arrestor is to arrest the voltage which is above normal level of voltage. Lightning arrestor behaves as open circuit for normal voltage but more than the normal voltage it becomes conductive and gets grounded.

Q.7. What is the purpose of permit to work system?

Ans. Permit to work system inbuilt safety to workmen engaged in electrical work. The Permit to work is the process which will promote a culture of safe working among its personnel while carrying out any work in electrical system. This in turn will ensure safety of personnel, safety of equipment and safety of society of large.

Q.8. What do you understand by the term used as "Dead Circuit"?

Ans. The Circuit in which there is no supply is termed as "Dead Circuit".

Section – C **10x5=50 Marks**

Answer all the questions.

Q.1. Write the safety instructions which have to be followed when working on a transformer.

Ans. 1) When work is to be carried out on a transformer, both low and high tension breakers and isolators shall
be opened. Similarly, during isolation of transformers to which potential transformers are connected, such
potential transformers shall be isolated.
2) Before starting any work on a transformer installation, it is important to check carefully for back feed,
abnormal voltage or other dangerous conditions. Unusual circuit conditions may exist which require special consideration.
3) Whenever transformers are replaced, the new transformer should be checked carefully for voltage, polarity and phase sequence before taking into service.
4) Area should always be cordoned off & Safety tagging should be done prior to starting the job on transformer.

Q.2. Write the steps which you will take when working on instrument transformers.

Ans. WORKING ON INSTRUMENT TRANSFORMERS:

1) The cases of all instrument transformers should be grounded.
2) Current transformers secondaries should never be open circuited when current is flowing in the primary.
3) The secondary circuit of current transformers should be connected to ground at all times when the
transformer is in service.
4) Potential transformers secondaries should never be shorted.
5) The low voltage winding of potential transformers should always have one side permanently and
effectively grounded.

Q.3. Which fire Extinguisher types are used for each class of fire and how to operate a CO_2 fire extinguisher?

Ans.

Type / Extinguisher	CLASS A Combustible materials (e.g. paper & wood)	CLASS B Flammable liquids (e.g. paint & petrol)	CLASS C Flammable gases (e.g. butane and methane)	CLASS D Flammable metals (e.g. lithium & potassium)	Electrical Electrical equipment (e.g. computers & generators)	CLASS F Deep fat fryers (e.g. chip pans)	Comments
Water	✓	✗	✗	✗	✗	✗	Do not use on liquid or electric fires
Foam	✓	✓	✗	✗	✗	✗	Not suited to domestic use
Dry Powder	✓	✓	✓	✓	✓	✗	Can be used safely up to 1000 volts
CO2	✗	✓	✗	✗	✓	✗	Safe on both high and low voltage
Wet Chemical	✓	✗	✗	✗	✗	✓	Use on extremely high temperatures

The different types of extinguisher tackle different types of fire extinguish.

To operate a CO_2 fire extinguisher simply follow the following steps "PASS" :

P – Pull the pin

A – Aim the nozzle low

S – Squeeze the handle, lever

S - Sweep

- P - Pull the pin. It is there to prevent accidental discharge.
- A - Aim low at the base of the fire. This is the where the fuel source is.
- S - Squeeze the lever above the handle. Release to stop the flow. ...
- S - Sweep from side to side. ...

Q.4. Explain in detail the philosophy of 5S. How it is useful for improving efficiency or quality in work place?

Ans. Principle of 5 S

The concept of "5S" originated in Japan. It is an integral tool of TQM which lays a very strong foundation for quality movement within the organization. The 5S are pre-requisites (basics) for any improvement programme. 5S Philosophy focuses on effective work place organization, simplifying work environment, reducing waste while improving quality and safety. There is no other way for improving efficiency or quality in work place.

The five S stands for the five first letters of these English words:

Japanese Term English Equivalent

Sort

Set In Order

Shine

Standardize

Sustain

Meanings:- Calling these principles as "5S" is a good way to remember their meaning and content. They stand for:-

Safety and the 5S

Efficiency and the 5S

Breakdown and the 5S

Quality and the 5S

Q.5. Write the First – Aid steps to be taken to reduce the suffering of the patient after an electrical accident until the doctor arrives.

Ans. GENERAL

First Aid means what one should do to reduce the suffering of the patient after an accident until the doctor

arrives, it may give life to dying person.

FIRST AID INSTRUCTIONS

1. Remove the patient from the source of accident / remove the cause of injury.
2. Keeps the injured person lying down in a comfortable position.
3. If the breathing has ceased, immediate measures must be taken to restore it.
4. If the patient has received burns attend to them.
5. When the patient has fractured a bone, no attempt must be made to move him.
6. Treat the patient for shock.
7. Send for medical help.

8. Never give water to patient.
9. Keep by standards away from the patient.
10. Keep the patient warm.