

**Bhartiya Skill Development University Jaipur**

School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 3rd Semester,
1st In-Sem. Examination

Course Code: ELE1301

Course Name: Automation and Control

Time: 1 Hour

Max. Marks: 20

Instruction: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries two marks. Answer all questions from section C, each question carries three marks. Scientific calculator is allowed. Draw neat and clean diagram.

Section – A

05X01 = 05 Marks

Q.1. Full form of the DCS is:

- | | |
|---------------------------------|-----------------------------|
| (a) Direct control System | (b) Distance control System |
| (c) Distributive control System | (d) None of these |

Q.2. Full form of the PAC is:

- | | |
|---|-------------------------------------|
| (a) Programmable automation controllers | (b) Pneumatic automatic controllers |
| (c) Pre-automation controllers | (d) None of these |

Q.3. What is the unit of Hydraulic pressure?

- | | |
|----------------------------|-------------------|
| (a) pounds per square inch | (b) N/m |
| (c) unit less | (d) None of these |

Q.4. The "PLC" was detailed in:

- | | |
|----------|----------|
| (a) 1978 | (b) 1968 |
| (c) 2000 | (d) 1869 |

Q.5. The function of Relay is: -

- | | |
|-----------------|------------------------------|
| (a) Programming | (b) Convert 230 VAC to 24VDC |
| (c) Protection | (d) None of these |

Section – B

03X02 = 06 Marks

Q.1. What are the applications of PLC?

Q.2. What is Batch process system? Explain with diagram.

Q.3. Give the comparison between PLC and DCS.

Section – C

03X03 = 09 Marks

Q.1. Differentiate between PLC and computer in Software and hardware.

Q.2. Explain the main features of DCS system.

Q.3. Explain the evolution of PLC.

Set-B

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(Answer Key ELE 1301)

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Section A

1. Full form of the DCS is: -
(c) Distributive control System
2. Full form of the PAC is: -
(a) Programmable automation controllers
3. What is the unit of Hydraulic pressure: -
(a) pounds per square inch
4. The "PLC" was detailed on: -
(b) 1968
5. The function of Relay is: -
(c) Protection

Section B

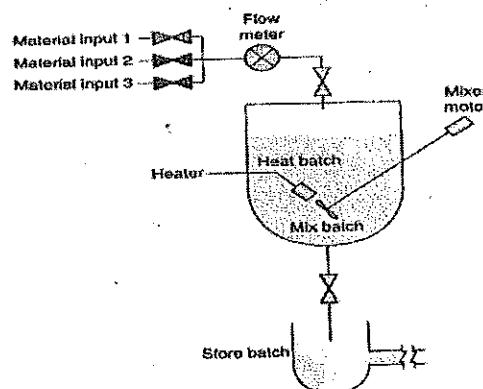
Ans.1.

Applications of PLC: -

- Bottle filling plant
- Mixing plant
- Traffic light control
- Packing industries
- Manufacturing industries
- Smart power system
- Chemical plant etc.

Ans.2.

Batch process: There is no flow of product material from one station of process to another. Instead, a set amount of each of the inputs to the process is received in a batch, and then same operation is performed on the batch to produce a product. For example:



Food, paint, and fertilizers etc.



Ans. 3.

Comparison between DCS and PLC controlling: -

Sr. no.	PLC	DCS
1	PLCs are primarily used for small applications and sequential control.	DCS are used for large applications and closed loop control
2	PLCs are much cost-effective for both small and large applications.	DCS are very costly for small applications.
3	PLCs are better for logic, are faster and have more rugged I/O.	DCS are superior in communication redundancy and data security.
4	This system is more easier to design.	This system is more difficult to design.

Section C

Ans. 1.

Comparison between PLC and Computer:

The architecture of a PLC is basically the same as that of a personal computer. A personal computer (PC) can be made to operate as a programmable logic controller if you provide some way for the computer to receive information from devices such as pushbuttons or switches. We also need a program to process the inputs and decide the means of turning load devices off and on. However, PLC is a specially designed computer to operate in an industrial environment. The main difference between computer and PLC are list below on two sections hardware and software.

Hardware:

- The PLC comes with its program language built into its memory and has no the permanently attached keyboard CD drive or monitor. While computers are permanently attached to a keyboard and other hardware.
- Computers are complex computing machines capable of executing several programs or tasks simultaneously and in any order. Most PLCs, on the other hand, execute a single program in an orderly and sequential fashion from first to last instruction.

Software:

- PLC software that allows the user to monitor and control the process is also called a human machine interface (HMI). It enables the user to view a process—or a graphical representation of a process—on a monitor, determine how the system is running, trend values, and receive alarm condition.
- Programmable automation controllers (PAC) combine PLC ruggedness with PC functionality. Using PACs, you can build advanced systems incorporating software capabilities such as advanced control, communication, data logging, and signal processing with rugged hardware performing logic, motion, process control, and vision.





Ans. 2.

Main features of DCS are:

- Distributive control permits the distribution of the processing task among several controllers.
- Each PLC control its associated machine or process.
- High speed communication among the computers is done through CAT-5 or CAT-6 twisted pair wires, single coaxial cables, fiber optics, or the Ethernet.
- Depending on the process, one PLC failure would not halt the complete process.
- DCS is supervised by a host computer that may perform monitoring/supervising functions such as report generation and storage of data.

Ans. 3.

Evolution of PLC:

- Before the days of the PLC the only way to control machinery was through the use of relays. Relays work by utilizing a coil that, when energized, creates a magnetic force to effectively pull a switch to the ON or OFF position. When the relay is de-energized, the switch releases and returns the device to its standard ON or OFF position. But Troubleshooting would take hours, and because coils would fail and contacts would wear out, there was need for lots of troubleshooting. These machines had to follow a strict maintenance schedule and they took up a lot of space.
- Then Tom began working as a controls designer, automating metal working machinery and equipment with industrial relays, pneumatic plunger timers, and electro-mechanical counters. Also included were fuses, control transformers, motor starters, overload relays, pushbuttons, selector switches, limit switches, rotary drum sequencers, pilot lights, solenoid valves, etc.
- Then Dick Morley, the father of the PLC, "The programmable controller" was detailed on New Year's Day, 1968."

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School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 3rd Semester,
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Course Code: ELE1302**Time: 1 Hour****Course Name: Electrical Machine Design Developer****Max. Marks: 20**

Instruction: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries two marks. Answer all questions from section C, each question carries three marks. Scientific calculator is allowed.

Section – A

05X01 = 05 Marks

Q.1. Unit of reactance is:

- (a) Wb (b) Tesla (c) Wb/Ampere (d) Ampere/Wb

Q.2. EMF generation in a machine is defined by:

- (a) Faraday's law of electromagnetic induction (b) Flemings left hand rule
(c) Right hand thumb rule (d) None of the above

Q.3. Class C insulator can withstand up to the temperature of

- (a) 155^o C (b) Above 180^o C (c) 90^o C (d) 120^o C

Q.4. Unit of relative permeability is:

- (a) Meter/henry (b) Henry/meter
(c) It is a unit less quantity (d) None of the above

Q.5. Magneto motive force has the analogy with _____ in electric circuit:

- (a) Voltage (b) Current (c) Power (d) None of these

Section – B

03X02 = 06 Marks

Q.1. Write short note on High resistivity materials.

Q.2. Write short note on applications of insulating materials.

Q.3. What do you understand by the term Magnetic leakage.

Section – C

03X03 = 09 Marks

Q.1. What are core losses? Explain these in brief.

Q.2. Explain classification of insulating materials.

Q.3. A rotor of open slots whose $W_s = W_t = 12\text{mm}$ and gap length $L_g = 2\text{mm}$. If there are no radial ducts, then calculate the effective length of air gap if $K_{cs} = 1/(1+5L_g/W_s)$.

Set-B

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Answer Key
ELE1302

School of Electrical Skills
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B. Voc. Program, 3rd Semester,
1st In-Sem. Examination

Course Code: ELE1302
Course Name: Electrical Machine Design Developer

Time: 1 Hour
Max. Marks: 20

Section - A

05X01 = 05 Marks

- A.1. (d)
- A.2. (a)
- A.3. (b)
- A.4. (c)
- A.5. (a)

Section - B

03X02 = 06 Marks

Ans. 1. High resistivity materials:

These materials are used for making resistances and heating devices.

Materials of high resistivity:

They can be classified according to their purpose. These categories are:

- The first group consist of materials used in precision measuring instruments and in making standard resistance boxes. Examples: Manganin
- The second group consist of materials from which resistance elements are made for all kinds of rheostats and similar control devices. Example: alloy of 60-65% of copper and 40-35% of nickel.
- The third group consists of materials suitable for making high temperature elements for electric furnaces heating devices and loading rheostats. Example: Alloys of nickel, chromium and iron known as Nichrome, etc.

Ans. 2. Applications of insulating materials:

Applications of Insulating Materials :-

- (i) Insulating materials for wires :- enamel, cotton, rayon, silk & fibrous glass
- (ii) Insulating materials for laminations :- Insuline, Oxide & Varnish
- (iii) Insulating materials for MIs :-
 - 1> class A Materials :- Cotton & oiled cambric Tapes ; Tough fibrous Materials, Nylon & Terylene .
 - 2> class B materials :- fibrous glass tape, Asbestos tapes, Mica
- (iv) Insulating materials for Transformers :-
 - fibrous (class A) materials are use for both air-cooled & oil cooled x-formers.
 - Cotton or oiled cambric used for taping the coils
 - Synthetic-resin-bonded paper used for insulation b/w core & coils
 - High grade marilla paper tape is usually employed for insulating the conductors
 - Pressboard is employed as spacers, packing b/w coils barriers b/w coils & tank etc.

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Ans. 3. Magnetic Leakage:

For the operation of electric machine, some air gaps are necessary in the magnetic paths but these air gaps should be kept to a minimum of length and maximum of cross-section so as to reduce their reluctance. A long air gap of small cross-section would require a large mmf resulting in a tendency for the flux to wander away from its main path. This flux which strays away from the main path is called the Leakage flux. The leakage flux does not contribute to either transfer or conversion of energy.

For magnetic circuit calculations, a term 'leakage coefficient' is introduced in order to take into account the leakage flux.

Leakage coefficient, $C_l = \text{Total flux/useful flux}$

Higher the leakage coefficient more will be the leakage flux and vice-versa.

Section – C

03X03 = 09 Marks

Ans. 1.

Core losses:

Core losses comes under the category of constant losses. These losses occur in core of electrical machines. Core losses are of two types:

- Hysteresis loss
- Eddy current loss

These losses are explained below:

➤ Hysteresis losses:

When a material is magnetized, its domains are aligned in the direction of the applied field. If the material is magnetized in the reverse direction, the domains swing around to align themselves in the opposite direction. If there is a loss of power called hysteresis loss. This loss appears in the form of heat and raises the temperature of the magnetic material. Its unit is Watt.

$$P_h = v k_h (B_m)^n f$$

Where, v = volume of the core

K_h = hysteresis losses

B_m = maximum value of flux density

f = frequency of supply

➤ Eddy Current losses:

Whenever the magnetic flux linking a conducting material circuit changes a voltage is induced in it. Consider a solid iron core with such a time varying flux is linking. Since iron is conducting material, each shell may be treated as closed coil. Each shell links with same portion of the flux. Hence a voltage is induced in each shell. Each induced voltage causes a current to flow in its closed shell. Since these currents do not flow in any clearly defined path, they are called eddy currents. Heat is generated due to the flow of eddy currents through the core. The power loss due to eddy currents is called eddy current loss.

The eddy-current loss per unit volume of a magnetic core subjected to a time-varying flux is given by P_e . Its unit is Watt/m³.

$$P_e = P_k * t^2 * f^2 * B_m^2$$

Where, B_m = maximum flux density

f = frequency of excitation

t = thickness of core

P_e = eddy-current constant

Ans. 2. Classification of Insulating materials:

S. No.	Class	Temperature range	Examples
1	Y	90°C	Cotton, silk, paper, wood, etc.
2	A	105°C	Materials of class Y impregnated by natural resins cellulose esters, insulating oils, etc
3	E	120°C	Synthetic resins enamles, cotton and paper lamination with formaldehyde banding, etc



4	B	130°C	Mica, glass, fiber, asbestos
5	F	155°C	Materials of class B with bonding materials of higher stability
6	H	180°C	Glass, fiber and asbestos materials
7	C	Above 180°C	Mica, ceramics, glass, quartz with Silicon resins

Class Y: This insulation consists of materials or combination of materials such as cotton, silk and paper without impregnation. Its temperature range is 90°C.

Class A: This insulation consists of materials or combination of materials such as cotton, silk and paper with suitably impregnated or clotted in a dielectric liquid such as oil. It can sustain up to 105°C.

Class E: This insulation consists of materials or combination of materials such as synthetic resins, enamels, cotton and copper laminator. It can withstand up to temperature of 120°C.

Class B: This insulation consists of materials or combination of materials such as mica glass fiber, asbestos etc. with suitable bonding substances. It can sustain up to 130°C.

Class F: This insulation consists of materials or combination of materials such as mica, glass, fiber, asbestos with suitable bonding substances as well as other materials. Class F is of high thermal stability than class B. It can withstand up to temperature of 155°C.

Class H: This insulation consists of materials or combination of materials such as glass, fiber, asbestos materials. It can withstand up to a temperature of 180°C.

Class C: This insulation consists of materials or combination of materials such as Mica, ceramics, glass, quartz with Silicon resins. It can withstand up to temperature of above 180°C.

Ans. 3.

Solution. Carter's co-efficient for slots

$$K_{cs} = \frac{1}{1 + 5 \times 2 / 12} = 0.545$$

Slot pitch

$$y_s = W_s + W_t = 24 \text{ mm.}$$

From Eqn. 3.12, gap contraction for slots

$$K_{sg} = \frac{y_s}{y_s - K_{cs}W_s} = \frac{24}{24 - 0.545 \times 12} = 1.37.$$

Since there are no ducts, gap contraction factor for ducts, $K_{gd} = 1$.

From Eqn. 3.26, total gap contraction factor $K_g = K_{gs} = 1.37 \times 1 = 1.37$.

∴ Effective gap length (see Eqn. 3.36) $l_{gs} = K_g l_g = 1.37 \times 2 = 2.74 \text{ mm.}$

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School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 3rd Semester,
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Course Code: ELE 1303

Time: 1 Hour

Course Name: Electrical Circuit Analysis

Max. Marks: 20

Instruction: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries two marks. Answer all questions from section C, each question carries three marks. Scientific calculator is allowed.

Section – A

05X01 = 05 Marks

Q.1. Kirchoff's 2nd law is consequence of law of conservation of:

- (a) Energy (b) Charge (c) Momentum (d) Power

Q.2. Every _____ is a _____ but every _____ is not a _____.

- (a) Mesh, loop, loop, mesh (b) Loop, mesh, mesh, loop
 (c) Loop, mesh, loop, mesh (d) Mesh, loop, mesh, loop

Q.3. If there are 10 nodes in a circuit, how many equations do we get?

- (a) 10 (b) 9 (c) 8 (d) 7

Q.4. How many nodes are taken as reference nodes in a nodal analysis?

- (a) 1 (b) 2 (c) 3 (d) 4

Q.5. When assigning branch currents, you need not be concerned with the direction you choose.

- (a) True (b) False

Section – B

03X02 = 06 Marks

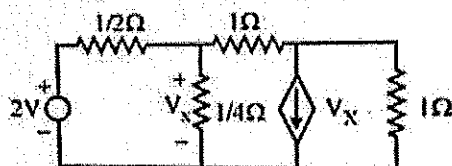
Q.1. What do you mean by dependent and independent voltage sources?

Q.2. What is DC Current source? Differentiate between ideal and non-ideal current sources

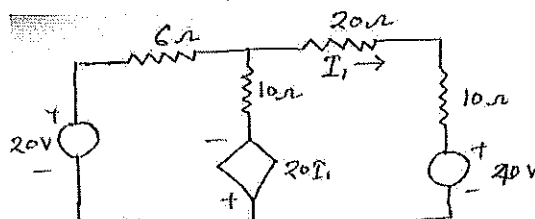
Q.3. How many Types of Circuit Loads are there in a Common Electrical Circuit?

Section – C

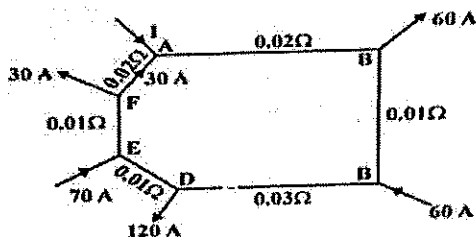
03X03 = 09 Marks

Q.1. In the network of figure, find voltage V_x by Nodal analysis.

Q.2. Find voltage across 20 ohm resistor as given in figure using mesh method.



Q.3. Find the currents in all branches of the network, as shown in figure.



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Set-B

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1st In-Sem. Examination

Course Code: ELE 1303

Course Name: Electrical Circuit Analysis

Max. Marks: 20

Section – A

05X01 = 05 Marks

1. Ans, (a) Energy
2. Ans. (a) Mesh, loop, loop, mesh
3. Ans. (b) 9
4. Ans. (a) 1
5. Ans. (a) True

Section – B

03X02 = 06 Marks

Ans. 1.

In general, there are two main types of DC sources

1. Independent (Voltage and Current) Sources
2. Dependent (Voltage and Current) Sources

An independent source produces its own voltage and current through some chemical reaction and does not depend on any other voltage or current variable in the circuit. The output of a dependent source, on the other hand, is subject to a certain parameter (voltage or current) change in a circuit element. Herein, the discussion shall be confined to independent sources only.

Ans. 2.

A current source, unlike the DC voltage source, is not a physical reality. However, it is useful in deriving equivalent circuit models of semiconductor devices such as a transistor. It can also be subdivided into ideal and non-ideal categories.

The Ideal Current Source By definition, an ideal current source that produces a current which is independent of the variations in load. In other words the current supplied by an ideal current source does not change with the load voltage.

Non-Ideal or Practical Current Source The current delivered by a practical current source falls off with an increase in load or load voltage.



Ans. 3.

A load generally refers to a component or a piece of equipment connected to the output of an electric circuit. In its fundamental form, the load is represented by any one or a combination of the following:

1. Resistor (R)
2. Inductor (L)
3. Capacitor (C)

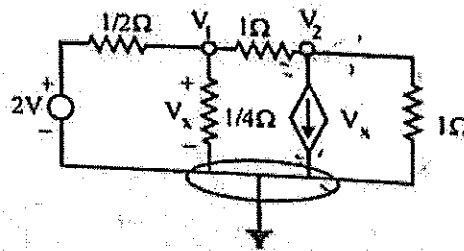
A load can either be of resistive, inductive or capacitive nature or a blend of them. For example, a light bulb is a purely resistive load whereas a transformer is both inductive and resistive. A circuit load can also be referred to as a sink since it dissipates energy whereas the voltage or current supply can be termed as a source.

Section – C

03X03 = 09 Marks

Ans. 1.

The circuit has three nodes. The bottom node is selected as reference and other node voltage as V_1 and V_2 .



The KCL equation at node V_1

$$\frac{V_1 - 2}{1/2} + \frac{V_1}{1/4} + \frac{V_1 - V_2}{1} = 0$$
$$7V_1 - V_2 = 4 \quad \dots(1)$$

The KCL equation at node V_2

$$\frac{V_2 - V_1}{1} + V_x + \frac{V_2}{1} = 0$$

As $V_x = V_1$

$$V_2 - V_1 + V_1 + V_2 = 0$$

$$2V_2 = 0$$

$$V_2 = 0 \quad \dots(2)$$

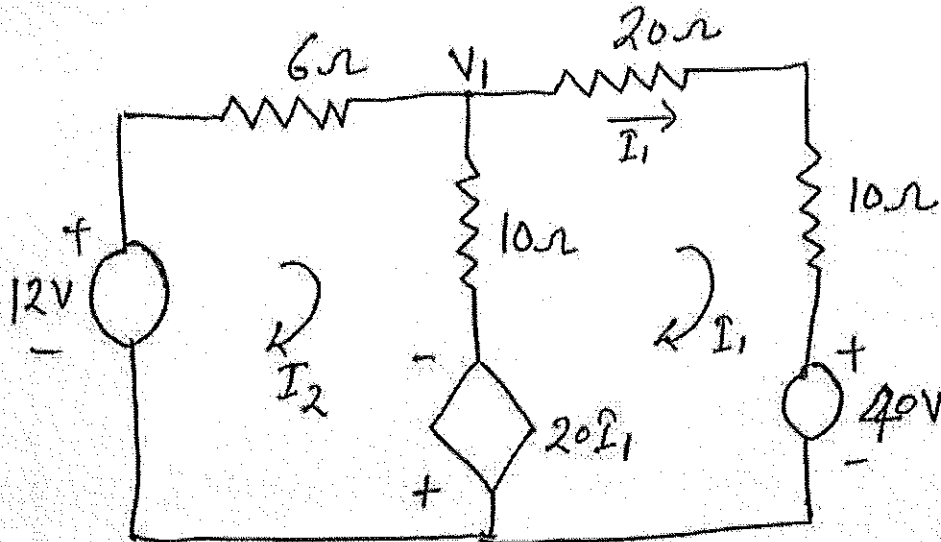
From equation (1) and (2)

$$V_1 = V_x = \frac{4}{7} \text{ V}$$

Ans.

Ans. 2.

The circuit contains two loops. The second loop current is taken as I_1 because in 20 ohm resistance current given is I_1 . The first loop current is I_2 .



The KVL equation in loop I_2

$$+12V - 6I_2 - 10(I_2 - I_1) + 20I_1 = 0$$

$$-30I_1 + 16I_2 = 12 \quad \text{--- ①}$$

The KVL equation in loop I_1

$$-20I_1 - 10(I_1 - I_2) - 20I_1 - 10I_1 - 40 = 0$$

$$60I_1 - 10I_2 = -40 \quad \text{--- ②}$$

So using Cramer's rule I_1 is
$$I_1 = \frac{\begin{vmatrix} 12 & 16 \\ -40 & -10 \end{vmatrix}}{\begin{vmatrix} -30 & 16 \\ 60 & -10 \end{vmatrix}} = \frac{-120 + 16 \times 40}{300 - 16 \times 60} = \frac{-520}{660} = -0.788 \text{ A}$$

The voltage drop in 20Ω resistance

$$V = I_1 \times 20 = -0.788 \times 20 = -15.76 \text{ V Ans.}$$

Ans. 3.

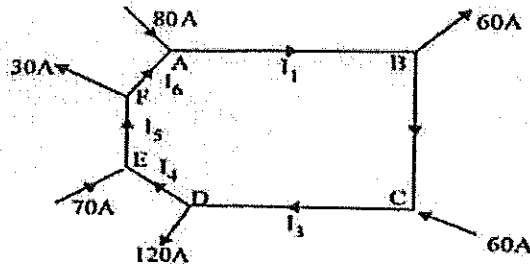
Sol. The given circuit has 6 nodes. As, in any electrical circuit the total current in any section of the circuit must be zero. So for the given circuit. Sum of all current = 0

$$\therefore -I + 60 - 60 + 120 - 70 + 30 = 0$$

Because at node A, C, E currents are entering and at node B, D, F currents are leaving.

$$\therefore I = 80 A$$

So at node A, the 80 A current is entering. Now we apply the currents in the complete network as I_1, I_2, I_3, I_4, I_5 and I_6 .



Now apply KCL at each node.

At node A

$$-80 - I_6 + I_1 = 0 \quad \dots(1)$$

$$\text{At node B} \quad 60 - I_1 + I_2 = 0 \quad \dots(2)$$

$$\text{At node C} \quad -60 - I_2 + I_3 = 0 \quad \dots(3)$$

$$\text{At node D} \quad 120 - I_3 + I_4 = 0 \quad \dots(4)$$

$$\text{At node E} \quad -70 - I_4 + I_5 = 0 \quad \dots(5)$$

$$\text{At node F} \quad 30 - I_5 + I_6 = 0 \quad \dots(6)$$

As given in the circuit $I_6 = 30 A$ so

$$\text{from equation (6)} \quad I_5 = 30 + I_6 = 30 + 30 = 60 A \quad \text{Ans.}$$

$$\text{from equation (1)} \quad I_1 = I_6 + 80 = 30 + 80 = 110 A \quad \text{Ans.}$$

$$\text{from equation (2)} \quad I_2 = I_1 - 60 = 110 - 60 = 50 A \quad \text{Ans.}$$

$$\text{from equation (3)} \quad I_3 = I_2 + 60 = 50 + 60 = 110 A \quad \text{Ans.}$$

$$\text{from equation (4)} \quad I_4 = I_3 - 120 = 110 - 120 = -10 A \quad \text{Ans.}$$

$$\therefore \text{from equation (5)} \quad I_5 = I_4 + 70 = -10 + 70 = 60 A \quad \text{Ans.}$$

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Session: 2019-20 (Summer Semester)
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Course Code: ELE 1304**Time: 1 Hour****Course Name: Electrical Measuring Instruments****Max. Marks: 20**

Instruction: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries two marks. Answer all questions from section C, each question carries three marks. Scientific calculator is allowed.

Section – A

05X01 = 05 Marks

- Q.1. The material used for indicating instrument pointer is made up of:
(a) Copper (b) Aluminium (c) Silver (d) Soft steel
- Q.2. In electrical measuring instruments electrical energy is converted to
(a) Mechanical energy (b) Heat energy
(c) Chemical energy (d) Light energy
- Q.3. An instrument's reliability means:
(a) The extent to which the characteristics remain linear
(b) The life of the instrument
(c) The degree to which the repeatability continues to remain within specific limits
(d) All of the above
- Q.4. The material used for making of Shunts are comprised of
(a) Copper (b) Aluminium (c) Silver (d) Magnesium
- Q.5. Permanent magnet moving iron instrument can be used for?
(a) AC (b) DC. (c) Both of these (d) None of these.

Section – B

03X02 = 06 Marks

- Q.1. What is permanent magnet moving coil? Illustrate in detail.
- Q.2. What are the different categories of instruments? Discuss with their applications.
- Q.3. The measured and true values of resistance are 5.86Ω and 4.8Ω . Determine the absolute static error of measurement.

Section – C

03X03 = 09 Marks

- Q.1. Mention the different types of torques to which the moving stem of an indicating instrument are subjected.
- Q.2. The measured value of inductor is 3.06mH and its true value is 2.09mH . Determine the relative static error.
- Q.3. Write the different types of errors associated with instruments. Discuss in detail.

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- Q.1. What is permanent magnet moving coil? Illustrate in detail.
- Q.2. What are the different categories of instruments? Discuss with their applications.
- Q.3. The measured and true values of resistance are 5.86Ω and 4.8Ω . Determine the absolute static error of measurement.

Section – C

03X03 = 09 Marks

- Q.1. Mention the different types of torques to which the moving stem of an indicating instrument are subjected.
- Q.2. The measured value of inductor is 3.06mH and its true value is 2.09mH . Determine the relative static error.
- Q.3. Write the different types of errors associated with instruments. Discuss in detail.

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**BHARTIYA SKILL DEVELOPMENT UNIVERSITY**

School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 3rd Semester,
1st In-Sem. Examination

Course Code: ELE 1304

Course Name: Electrical Measuring Instruments

Section – A

Time: 1 Hour

Max. Marks: 20

05X01 = 05 Marks

1. Ans. (b)
2. Ans. (a)
3. Ans. (c)
4. Ans. (d)
5. Ans. (c)

Section – B

03X02 = 06 Marks

Ans. 1.

PMMC stands for 'Permanent magnet moving coil'. It is one of the simple and most used instrument on board with sophisticated names. They are used on board to assist in regular maintenance of electrical equipment or when precise measurements are required. Apart from PMMC and permanent magnet moving coil; they are also known as D'alvanometer (A type of galvanometer based on D'Arsonval principles).

It is a simple machine which create stationary magnetic fields with two powerful permanent magnet. This is then used with the moving coil connected to the electric source to produce deflection torque; according to the popular theory of Fleming left hand rule.

Ans. 2.

- **Indicating** instruments are those instruments which indicate the magnitude of a quantity being measured.
- **Recording** instruments give a continuous record of the quantity being measured over a specified period.
- **Integrating** instruments totalize events over a specified period of time. The summation, which they give is the product of time and an electrical quantity

Ans. 3.

The measured and true values of resistance are 5.86Ω and 4.8Ω . Determine the absolute static error of measurement.

Sol 3: Measured Value $A_m = 5.86\Omega$

True value $A_t = 4.8\Omega$

Absolute static error is: $\delta = A_m - A_t$

$5.86 - 4.8 = 1.06 \Omega$

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Section – C

03X03 = 09 Marks

Ans. 1.

Deflecting Torque: The deflecting torque causes the moving system to move from its zero position. The controlling torque (T_c) opposes the deflecting torque and increases with the deflection of the moving system. The pointer comes to rest at a position where the two opposing torques are equal.

Controlling Torque: The controlling torque performs two functions. Controlling torque increases with the deflection of the moving system so that the final position of the pointer on the scale will be according to the magnitude of an electrical quantity (i.e. current or voltage or power) to be measured.

Damping torque: In a measuring instrument, the damping torque is necessary to bring the moving system to rest to indicate steady reflection in a reasonable short time. It exists only as long as the pointer is in motion. Under the absence of damping torque the pointer oscillates for a short period of time and comes to steady position

Ans. 2.

Measured Value $A_m = 3.06 \times 10^{-3}$ H

True value $A_t = 2.09 \times 10^{-3}$ H

Absolute static error is: $\delta = A_m - A_t = 0.97 \times 10^{-3}$

$\%t_r = \delta / A_t = 0.97 \times 10^{-3} / 2.09 \times 10^{-3}$

4.64%

Ans. 3.**Absolute Error**

There are two types of error that are affected by the accuracy of measuring tools. The **absolute error** is defined as the absolute value (or magnitude) of the difference between the measured value and the true value. Thus, let:

- e_a = the absolute error
- x_m = the measured value
- x_t = the true value

The formula for computing absolute error is:

$$e_a = |x_m - x_t|$$

Limiting Error

Definition: The limited deviation of the measured value from the true value is known as the limiting error or guarantee error. Such type of error is fixed on the instrument. The magnitude of the limiting error depends on the design, material and the workmanship used for the construction of the instrument.

$$A_a = A_s \pm \delta A \dots \text{equ}(1)$$

Where,

A_a – actual value

A_s – specified or rated value

δA – limiting error or tolerance



BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, 3rd Semester,

1st In-Sem. Examination

Course Code: ELE 1305

Time: 1 Hour

Course Name: Introduction to Power System

Max. Marks: 20

Instruction: Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries two marks. Answer all questions from section C, each question carries three marks. Scientific calculator is allowed.

Section – A

05X01 = 05 Marks

Q.1. The fuel used in Nuclear power plant is:

- (a) Uranium (b) Thorium (c) radium (d) coal

Q.2. Thermal power plant is:

- (a) Non-renewable source of energy (b) Conventional source of energy
(c) Non-conventional source of energy (d) Continuous source of energy

Q.3. The cost of fuel transportation is maximum in.....

- (a) Hydro-electric power plant (b) Steam power plant
(c) Nuclear power plant (d) Diesel power plant

Q.4.requires more space

- (a) Nuclear power plant (b) Hydro-electric power plant
(c) Thermal power plant (d) Diesel power plant

Q.5. Which process is responsible for production of energy in the Nuclear power plant?

- (a) Nuclear fission reaction (b) Nuclear fusion reaction
(c) Exothermal chemical reaction (d) All of the above

Section – B

03X02 = 06 Marks

Q.1. Which is the largest hydro power plant in India?

Q.2. Write the name of the first nuclear power plant in India?

Q.3. Write the name of the biggest thermal power plant in India, and also write its installed capacity.

Section – C

03X03 = 09 Marks

Q.1. Write the advantages and disadvantages of Thermal power plant?

Q.2. Draw and explain the layout of hydro power.

Q.3. What are the functions of feed water heater, economizer and air preheater?

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Set-B

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Electrical Skills
Session: 2019-20 (Summer Semester)
B. Voc. Program, 3rd Semester,
1st In-Sem. Examination

Course Code: ELE 1305
Course Name: Introduction to Power System

Time: 1 Hour
Max. Marks: 20

Section – A

05X01 = 05 Marks

1. Ans. (a)
2. Ans. (b)
3. Ans. (b)
4. Ans. (c)
5. Ans. (a)

Section – B

03X02 = 06 Marks

Ans. 1.

The Koyna Hydroelectric Project is the largest completed hydroelectric power plant in India. It is a complex project with four dams including the largest dam on the Koyna River, Maharashtra hence the name Koyna Hydroelectric Project.

The total capacity of the project is 1,960 MW

Ans. 2.

Tarapur Atomic Power Station (T.A.P.S.) was the first nuclear power plant in India. The construction of the plant was started in 1962 and the plant went operational in 1969. The 320 MW Tarapur nuclear power station housed two 160 MW boiling water reactors (BWRs), the first in Asia.

Ans. 3.

Vindhyachal Thermal Power Station in the Singrauli district of Madhya Pradesh, with an installed capacity of 4,760MW, is currently the biggest thermal power plant in India. It is a coal-based power plant owned and operated by NTPC.

Section – C

03X03 = 09 Marks

Ans. 1.

ADVANTAGES

The fuel used is quite cheap.

Less initial cost as compare to other generating stations.

It can be installed at any place irrespective of the existence of coal. The coal can be transported to the site of plant by rail or roads.

DISADVANTAGES

It pollutes the atmosphere due to producing large amount of smoke and fumes.

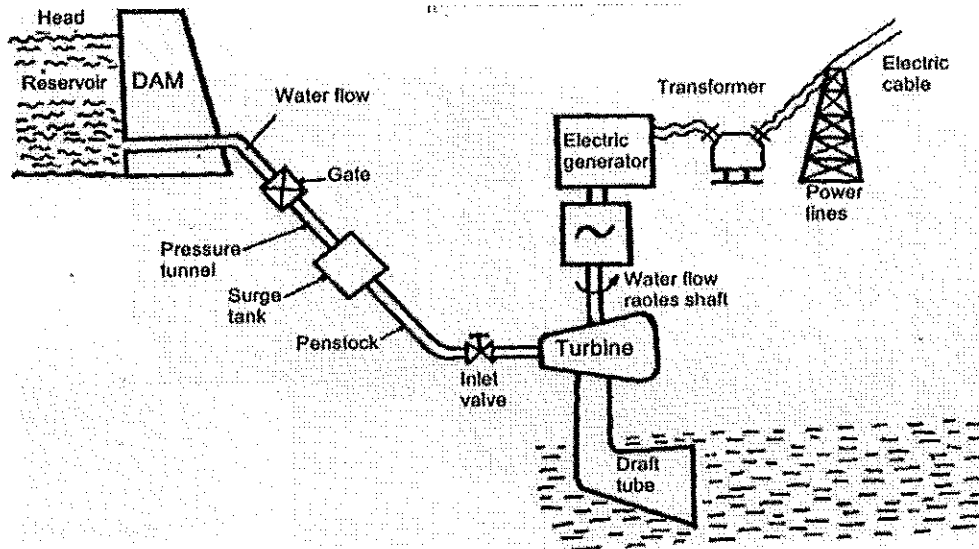
Higher maintenance cost and operational cost.

Huge requirement of water.

Ans. 2.

In Hydro Power Plant the water is utilized to move the turbines which in turn run the electric generator's.

- The Potential energy of the water stored in the dam gets converted into the Kinetic Energy of the moving water in the penstock. And this Kinetic Energy gets converted into the Electrical Energy with the help of Turbine & Generator (T-G) combination.



Ans. 3.

FEED WATER HEATER

Feed water heating improves overall plant efficiency.

Thermal stresses due to cold water entering the boiler drum are avoided.

Quality of steam produced by the boiler is increased.

ECONOMIZER

Flue gases coming out of the boiler carry lot of heat. An economizer extracts a part of this heat from flue gases and uses it for heating feed water.

Saving coal consumption and higher boiler efficiency.

AIR PREHEATER

The function of air preheaters is to preheat the air before entering to the furnace by utilizing some of the energy left in the flue gases before exhausting them to the atmosphere.

After flue gases leave economizer, some further heat can be extracted from them and used to heat incoming heat. Cooling of flue gases by 20 degree centigrade increases the plant efficiency by 1%.

(3)

(3)