BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills

Session: 2021-22 (Summer Semester)

B. Voc. ELE/RET Program, III Semester,

2nd In-Sem. Examination

Course Code: ELE1301/ RET 1305 **Time: 1 Hour**

Course Name: Automation and Control **Max. Marks: 20**

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

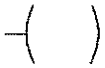
Section – A

05X01 = 05 Marks

1. The symbol of NC button is _____.

a) 

b) 

c) 

d) None of these

2. What is the SCADA?

a) Hardware

b) Software

c) Language

d) None of these

3. HMI stands for _____.

a) High Machine Interface

b) Human Machine Intelligence

c) Human Machine Interface

d) None of these

4. Which syntax is right for the input in the ladder logic programming of PLC?

a) O:0/3

b) I:0/4

c) T4:5

d) B3:0/6

5. The connection of the power supply VDC (-) to the input group's COM terminal is called _____.

a) Sinking Input

b) Sourcing Input

c) Either (a) or (b)

d) None of these

Section – B

03X02 = 06 Marks

1. Write 6 steps for fault diagnosis technique and Troubleshooting in the PLC.
2. What is SCADA?
3. What are the application of SCADA for automation?

Section – C

03X03 = 09 Marks

1. Explain the modes of operations of PLC.
2. Explain the working of PLC with the block diagram.
3. What is the scan cycle of PLC program and make the diagram of scan process for a single Rung programme.

Answers Key

Course Code: ELE1301/Ret1305, Course Name: Automation and Control
School of Electrical Skills, Session: 2021-22 (Summer Semester)
B. Voc. Program, III Semester, 1st In-Sem. Examination

Section – A

05X01 = 05 Marks

Ans 1. (b) 

Ans 2. (b) Software
Ans 3. (c) Human Machine Interface
Ans 4. (b) I:0/4
Ans 5. (a) Sinking Input

Section – B

03X02 = 06 Marks

Ans 1.

The 6 Step Troubleshooting Approach consists of the following:

- Preparation
- Observation
- Define Problem Area
- Identify Possible Causes
- Determine Most Probable Cause
- Test and Repair

Ans 2.

SCADA:

- "SCADA stands for Supervisory Control and Data Acquisition; it is an industrial computer-based control system employed to gather and analyse the real-time data to keep track, monitor and control industrial equipment in different types of industries."
- A SCADA system gathers information, such as where a leak on a pipeline has occurred, transfers the information back to a central site, alerting the home station that the leak has occurred, carrying out necessary analysis and control, such as determining if the leak is critical, and displaying the information in a logical and organized fashion.
- SCADA systems can be relatively simple, such as one that monitors environmental conditions of a small office building, or incredibly complex, such as a system that monitors all the activity in a nuclear power plant or the activity of a municipal water system.
- SCADA systems were first used in the 1960s
- SCADA systems are used to monitor and control a plant or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining and transportation.
- Basic SCADA connected system is shown in fig.:

Answers Key

Course Code: ELE1301/Ret1305, Course Name: Automation and Control
School of Electrical Skills, Session: 2021-22 (Summer Semester)
B. Voc. Program, III Semester, 1st In-Sem. Examination

Ans 3.

There are numerous applications of SCADA systems, but a few most frequently used SCADA applications include:

1. Manufacturing Industries
2. Waste Water Treatment and Distribution Plants
3. SCADA in Power System

Section – C

03X03 = 09 Marks

Ans 1.

Mode of operations in PLC:

A processor has basically two modes of operations: the program mode and some variations of the run mode. The number of different operating modes and the methods of accessing them varies with the manufacturer. Fig. shows a typical three position key switch used to select different processor modes of operation. Some common operating modes are explained as follows:

1. Program Mode: The program mode is used to enter a new program, edit or update an existing program, upload files, download files, document (print out) programs, or change any software configuration set in the program. When the PLC is switched into the program mode, all output is forced OFF regardless of their rung logic status, and the ladder I/O scan sequence is halted.

2. Run Mode: The Run mode is used to execute the user program. Input devices are monitored and output devices are energized accordingly. After all instructions have been entered in a new program and all changes made to existing program, the processor is put in the run mode.

3. Test Mode: The Test mode is used to operate or monitor the user program without energizing any outputs. The processor still reads inputs, executes the ladder program, and update the output image table files, but without energizing the output circuit. This feature is often used after debugging or editing a program to test the program execution before allowing the PLC to operate machine outputs.

4. Remote Mode: In the Run position, all logic is solved and I/O is enabled. In the program position, all logic solving is stopped and the I/O is disabled. The remote position allows the PLC to be remotely switched between program and run mode by personal computer connected to the RS-232 port. The remote mode may be beneficial when the controller is in a location that is not easily accessible.

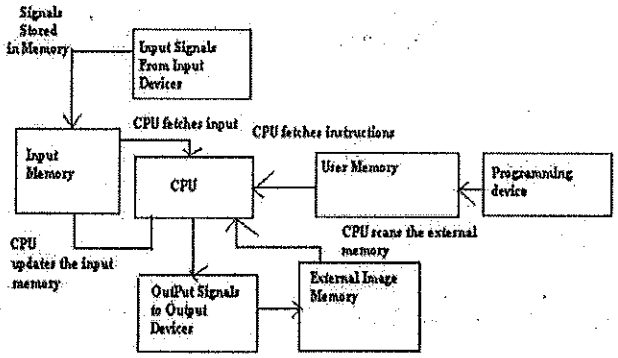
Answers Key

Course Code: ELE1301/Ret1305, Course Name: Automation and Control
School of Electrical Skills, Session: 2021-22 (Summer Semester)
B. Voc. Program, III Semester, 1st In-Sem. Examination

Ans 2.

Working of PLC:

- The input sources convert the real time analog electric signals to suitable digital electric signals and these signals are applied to the PLC through the connector rails.
- These input signals are stored in the PLC external image memory in locations known as bits. This is done by the CPU
- The control logic or the program instructions are written onto the programming device through symbols or through mnemonics and stored in the user memory.
- The CPU fetches these instructions from the user memory and executes the input signals by manipulating, computing, processing them to control the output devices.
- The execution results are then stored in the external image memory which controls the output drives.
- The CPU also keeps a check on the output signals and keeps updating the contents of the input image memory according to the changes in the output memory.
- The CPU also performs internal programming functioning like setting and resetting of the timer, checking the user memory.



Ans 3.

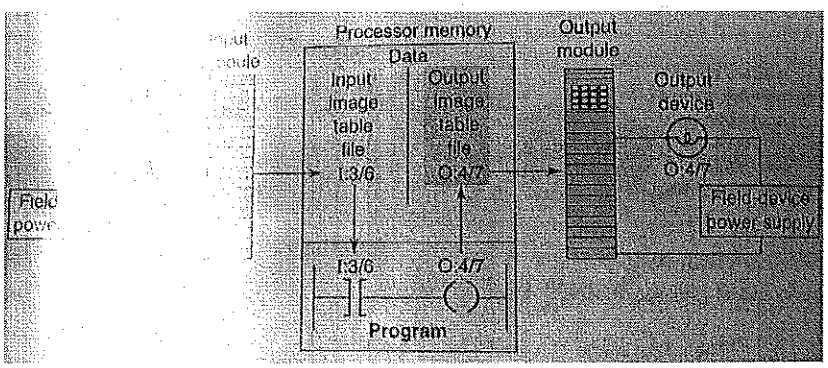
Scan Cycle of PLC Program:

- When a PLC execute a program, it must know in real time when external devices controlling a process are changing. During each operating cycle, the processor reads all the inputs, takes these values, and energizes or de-energizes the output according to the user program. This process is known as program scan cycle. Fig. illustrates a single PLC operating cycle consisting of the input scan, program scan, output scan and housekeeping duties. It constantly repeats this cycle as long as the PLC is in the RUN mode.
- The time it takes to complete a scan cycle is called the scan cycle time and indicates how fast the controller can react to change in inputs. The time required to make a single scan can vary from about 1 millisecond to 20 milliseconds. The actual scan time is calculated

and stored in t... ...mory. The PLC computes the scan time each time the END instruction is e...

- "The scan is n... ...tinuous and sequential process of reading the status of inputs, evaluating the ... ...and updating the output.

Scan process for ... ...g programme:



BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills

Session: 2021-22 (Summer Semester)

B. Voc. ELE Program, III Semester Electrical

2nd In-Sem. Examination

Course Code: ELE1304 **Time: 1 Hour**

Course Name: Electrical Measuring Instruments **Max. Marks: 20**

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

Section – A

05X01 = 05 Marks

1. LDR sensor used for?
   (a) Resistance detect (b) Light detect (c) Motion detect (d) Voltage detect

2. What does a tachometer measure?
   (a) Distance (b) Current (c) Rpm (d) Temperature

3. Current of any circuit can be measured:
   (a) in series (b) in parallel (c) either series or parallel (d) None of these

4. Unit of Energy is:
   (a) Kwh (b) Ohm (c) Voltage (d) All of these

5. What is a Megger used to measure?
   (a) Voltage (b) Radiation (c) Insulation resistance (d) Amp

Section – B

03X02 = 06 Marks

1. What is Electrical Measurements?
2. Write the Methods of minimization or elimination of errors.
3. Write the Advantages of Electrical Measuring Instruments:

Section – C

03X03 = 09 Marks

1. Explain the types of Measurement Errors.
2. What is Restoring Torque?
3. Explain About Any 3 Sensors.

Answers Key

Course Code: ELE1304 Course Name: Electrical Measuring Instruments
School of Electrical Skills, Session: 2021-22 (Summer Semester)
B. Voc. Program, III Semester, 2nd In-Sem. Examination

Section – A

05X01 = 05 Marks

1. (B)
2. (C)
3. (A)
4. (A)
5. (C)

Section – B

03X02 = 06 Marks

1. **Electrical measurements** are the methods, devices and calculations used to measure electrical quantities. Measurement of electrical quantities may be done to measure electrical parameters of a system.

   Example: Voltage, Current, Power, Resistance, Frequency etc

2. =Make sure the formulas used for measurement are correct.
   2=Cross check the measured value of a quantity for improved accuracy.
   3=Use the instrument that has the highest precision.
   4=It is suggested to pilot test measuring instruments for better accuracy.
   5=Use multiple measures for the same construct. Note the measurements under controlled conditions.

3. They are reliable all the times
   They are more power efficient
   They are more portable in the sense
   They can be moved around easily
   They can be used in a variety of power supply all over the world.

Section – C

03X03 = 09 Marks

1. Restoring Torque = Without controlling torque the pointer will swing at its maximum position & will not return to zero after removing the source. Controlling torque is produced either by spring or gravity control.
2. Gross Errors= These are basically human errors which may include misreading of the instruments, incorrect adjustment, improper application of instrument

Answers Key

Course Code: ELE1304 Course Name: Electrical Measuring Instruments
School of Electrical Skills, Session: 2021-22 (Summer Semester)
B. Voc. Program, III Semester, 2nd In-Sem. Examination

Random Errors= The random errors are those errors, which occur irregularly and hence are random. These can arise due to random and unpredictable fluctuations in experimental conditions (Example: unpredictable fluctuations in temperature, voltage supply, mechanical vibrations of experimental set-up, errors by the observer taking readings, etc. For example, when the same person repeats the same observation, it is very likely that he may get different readings every time.

Systematic Errors=

These errors can be divided into three different categories.

1. Instrumental errors
2. Environmental errors
3. Observational errors

3. LDR sensors

A Light Dependent Resistor (LDR) is also called a photo-resistor or a cadmium sulphide cell. It is also called a photoconductor. ... This optoelectronic device is mostly used in light varying sensor circuit, and light and dark activated switching circuits.

Motion sensor

A motion sensor, or motion detector, is an electronic device that uses a sensor to detect nearby people or objects.

Smoke sensor

A smoke detector is an electronic fire-protection device that automatically senses the presence of smoke.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, III Semester,

2nd In-Sem. Examination

Course Code: ELE1305 **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

1. Insulator material is made up of :
   (a) Porcelain (b) Glass (c) Polymer (d) All of the above

2. How many conductors are required in DC transmission System :
   (a) 2 (b) 3
   (c) 4 (d) None of the above

3. "According to Skin Effect current flows on the surface of the conductor". True or False
   (a) True (b) False

4. Up to 33KV which type of insulator is preferred
   (a) Suspension Type (b) Pin type (c) Strain Type (d) Shackle

5. For a 220kV line what will be the number of disc in a suspension type insulator
   (a) ~10 (b) ~15 (c) ~20 (d) None of them

Section – B

03X02 = 06 Marks

1. Define Ferranti Effect?
2. What should be the properties of a good insulator?
3. Explain all the factors that affect Skin Effect .

Section – C

03X03 = 09 Marks

1. What are the advantages of using DC transmission system over AC transmission?
2. Write a short note on followings

(a) Pin Type Insulator (b) Suspension Type Insulators (c) Di- Electric Strength

3. List the advantages and disadvantages of glass insulator.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program,3rd Semester,

2nd In-Sem. Examination

Course Code: ELE1305 **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

1. Insulator material is made up of :
   (a) Porcelain
   (b) Glass
   (c) Polymer
   (d) All of the above
2. How many conductors are required in DC transmission System :
   (a) 2 (b) 3
   (c) 4 (d) None of the above
3. "According to Skin Effect current flows on the surface of the conductor". True or False
   (a) True (b) False
4. Up to 33KV which type of insulator is preferred
   (a) Suspension Type
   (b) Pin type
   (c) Strain Type
   (d) Shackle
5. For a 220kV line what will be the number of disc in a suspension type insulator
   (a) ~10 (b) ~15 **(c) ~20** (d) None of them

Section – B

03X02 = 06 Marks

1. Define Ferranti Effect?

Answer- The effect in which the voltage at the receiving end of the transmission line is more than the sending voltage is known as the Ferranti effect. Such type of effect mainly occurs because of light load or open circuit at the receiving end.

Ferranti effect is due to the charging current of the line. When an alternating voltage is applied, the current that flows into the capacitor is called charging current. A charging current is also known as capacitive current. The charging current increases in the line when the receiving end voltage of the line is larger than the sending end.

2. What should be the properties of a good insulator?

- **Answer-** high mechanical strength in order to withstand the conductor load, wind load etc.
- high electrical resistance in order to minimize the leakage currents.
- high relative permittivity of insulating material so that the dielectric strength is high

high ratio of puncture strength to flashover

3. Explain all the factors that affect Skin Effect

Answer- Factors affecting skin effect

1. **Frequency** – Skin effect increases with the increase in frequency.
2. **Diameter** – It increases with the increase in diameter of the conductor.
3. **The shape of the conductor** – Skin effect is more in the solid conductor and less in the stranded conductor because the surface area of the solid conductor is more.
4. **Type of material** – Skin effect increase with the increase in the permeability of the material (Permeability is the ability of material to support the formation of the magnetic field).

Section – C

03X03 = 09 Marks

1. What are the advantages of using DC transmission system over AC transmission?

- Answer- Only two conductors are required for DC transmission system. It is further possible to use only one conductor of DC transmission system if the earth is utilized as the return path of the system.
- The potential stress on the insulator of the DC transmission system is about 70% of the equivalent voltage AC transmission system. Hence, DC transmission systems have reduced insulation costs.
- Inductance, capacitance, phase displacement and surge problems can be eliminated in DC system.
- The volume of conductor required in AC systems is much higher when compared to DC systems.
- The reactance of the line affects the voltage regulation of the electrical power transmission system.
- Problems of skin effects and proximity effects only found in AC systems.
- AC transmission systems are more likely to be affected by corona discharge than a DC transmission system.
- Construction of AC electrical power transmission network is more completed than DC systems.
- Proper synchronizing is required before interconnecting two or more transmission lines together, synchronizing can totally be omitted in DC transmission system.

2. Write a short note on followings

(a) Pin Type Insulator

A **pin insulator** consists of a non-conducting material such as porcelain, glass, plastic, polymer, or wood.

- As the name suggests, the pin type insulator is secured to the cross-arm on the pole.
- There is a groove on the upper end of the insulator for housing the conductor.
- The conductor passes through this groove and is bound by the annealed wire of the same material as the conductor.
- Pin type insulators are used for transmission and distribution of electric power at voltages upto 33 kV.
- Beyond operating voltage of 33 kV, the pin type insulators become too bulky and hence uneconomical

(b) Suspension Type Insulators

- For high voltages (>33 kV), it is a usual practice to use suspension type insulators consist of a number of porcelain discs connected in series by metal links in the form of a string.
- The conductor is suspended at the bottom end of this string while the other end of the string is secured to the cross-arm of the tower.
- Each unit or disc is designed for low voltage, say 11 kV.
- The number of discs in series would obviously depend upon the working voltage.
- For instance, if the working voltage is 66 kV, then six discs in series will be provided on the string.

(c) Di- Electric Strength

Dielectric strength is measured as the maximum voltage required to produce a dielectric breakdown through a material. It is expressed as Volts per unit thickness. Dielectric Strength is simply the maximum electric field that a material can withstand without experiencing failure of its insulating properties. It's measured in megavolts per meter (MV/m). The higher the Dielectric Strength, the better a material is to prevent electrical conductivity.

2. What are the advantages and disadvantages of glass insulator

- It has very high dielectric strength compared to porcelain.
- Its resistivity is also very high.
- It has low coefficient of thermal expansion.
- It has higher tensile strength compared to porcelain insulator.
- As it is transparent in nature, it is not heated up in sunlight as porcelain.
- The impurities and air bubble can be easily detected inside.
- Glass has very long service life as because mechanical and electrical properties of glass do not be affected by ageing.
- After all, glass is cheaper than porcelain.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.:.....

School of Electrical Skills

Session: 2021-22 (Summer Semester)

B. Voc. ELE Program, 3rd Semester,

2nd In-Sem. Examination

Course Code: ELE-1306 **Time: 1 Hour**

Course Name: Electrical Machines – I **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

1. Which of the following rule is used to determine the direction of rotation of D.C motor?
   a) Columb's Law
   b) Lenz's Law
   c) Fleming's Right-hand Rule
   d) Fleming's Left-hand Rule
2. If a DC motor is connected across the AC supply it will
   a) Run at normal speed
   b) Not run
   c) Run at lower speed
   d) Burn due to heat produced in the field winding by eddy currents.
3. In a DC shunt motor, speed is
   a) Independent of armature current
   b) Directly proportional to the armature current
   c) Proportional to the square of the current
   d) Inversely proportional to the armature current
4. What will happen if the e.m.f. of DC motor vanishes suddenly?
   a) The motor will stop
   b) The motor will continue to run
   c) The armature may burn
   d) The motor will run noisy
5. In case of DC shunt motors the speed is dependent on back e.m.f. only because
   a) Back e.m.f. is equal to armature drop
   b) Armature drop is negligible
   c) Flux is proportional to armature current
   d) Flux is practically constant in DC shunt motors

Section – B

03X02 = 06 Marks

1. What is the Principle of Operation of a D.C Motor?
2. What is back E.M.F or counter E.M.F?
3. What is the purpose of yoke in D.C. motor?

Section – C

03X03 = 09 Marks

1. Why a differentially compound motor is not used in practice?
2. Explain series and shunt wound DC motor in detail.
3. What do you understand by permanent magnet DC motor?

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.:.....

School of Electrical Skills (ELE)

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester,

2nd In-Sem. Examination

Course Code: ELE-1302 **Time: 1 Hour**

Course Name: Electrical Machines – I **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

Note: each question carries 01 mark.

1. Which of the following rule is used to determine the direction of rotation of D.C motor?
   a) Columb's Law
   b) Lenz's Law
   c) Fleming's Right-hand Rule
   d) Fleming's Left-hand Rule

2. If a DC motor is connected across the AC supply it will
   a) Run at normal speed
   b) Not run
   c) Run at lower speed
   d) Burn due to heat produced in the field winding by eddy currents.

3. In a DC shunt motor, speed is
   a) Independent of armature current
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   c) Proportional to the square of the current
   d) Inversely proportional to the armature current

4. What will happen if the e.m.f. of DC motor vanishes suddenly?
   a) The motor will stop
   b) The motor will continue to run
   c) The armature may burn
   d) The motor will run noisy

5. In case of DC shunt motors the speed is dependent on back e.m.f. only because
   a) Back e.m.f. is equal to armature drop
   b) Armature drop is negligible
   c) Flux is proportional to armature current
   d) Flux is practically constant in DC shunt motors

Section – B

03X02 = 06 Marks

Note: each question carries 02 marks.

1. What is the Principle of Operation of a D.C Motor?
   Solution: The operation of a D.C Motor based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. Basically, there is no constructional

difference between a d.c. motor and a d.c generator. The same d.c. machine can be run as a generator or motor.

2. What is back E.M.F or counter E.M.F?

Solution: When the armature of a d.c. motor rotates under the influence of the driving torque, the armature conductors move through the magnetic field and hence e.m.f. is induced in them as in a generator. The induced e.m.f. acts in opposite direction to the applied voltage V (Lenz's law) and in known as back or counter e.m.f Eb. It is always less than the applied voltage V, although this difference is small when the motor is running under normal conditions.

3. What is the purpose of yoke in D.C. motor?

Solution: The yoke or outer frame provides coverage to a dc motor. It is made up of **cast steel** for large dc motors. And of **cast iron** for small dc motors. The yoke is used in DC machine because:

A) It provides mechanical support to poles.

B) Acts as a protective cover against mechanical damage.

C) And provides a passage for the magnetic flux produced by the poles of the machine.

Section – C

03X03 = 09 Marks

Note: each question carries 03 marks.

1. **Why a differentially compound motor is not used in practice?**

Solution: In differential compound motor, as two fluxes oppose each other, the resultant flux decreases as load increases, thus the machine runs at a higher speed with increase in the load.

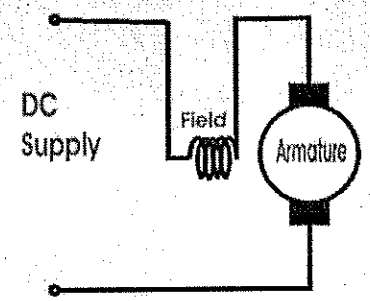
This property is dangerous as on full load, the motor may try to run with dangerously high speed. So, differential compound motor is generally not used in practice.

2. **Explain series and shunt wound DC motor in detail.**

Solution:

Series Wound DC Motor:

In case of a series wound self excited DC motor or simply **series wound DC motor**, the entire armature current flows through the field winding as its connected in series to the armature winding. The series wound self excited DC motor is diagrammatically represented below for clear understanding.



Series Excited DC Motor

Now to determine the torque speed characteristic of these types of DC motor, lets get to the torque speed equation.

From the circuit diagram we can see that the voltage equation gets modified to

$$E = E_b + I_a(R_a + R_s) \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where as back emf remains $E_b = k_a\varphi\omega$
Neglecting saturation we get,

$$\phi = K_1 I_f = K_1 I_a$$

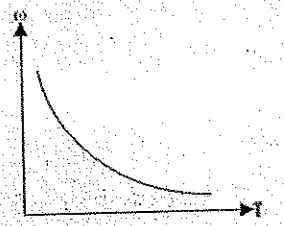
[since field current = armature current]

$$Therefore,\ E_b = k_a K_1 I_a \omega = K_s I_a \omega \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

From equation (5) and (6)

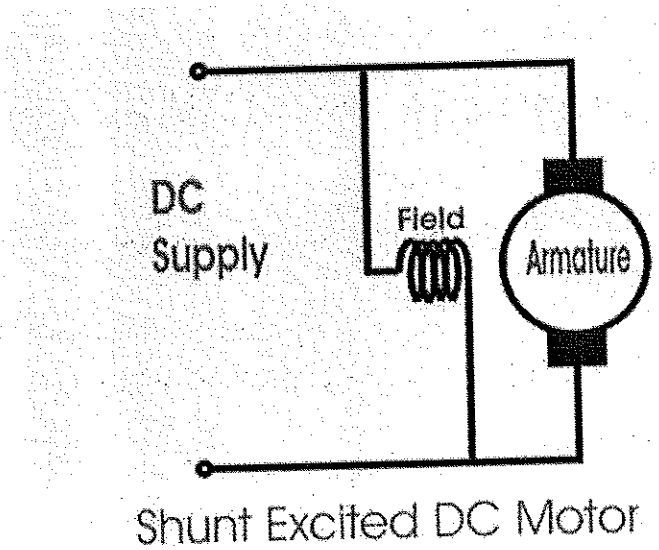
$$\omega = \frac{E}{K_s I_a} - \frac{R_a + R_s}{K_s}$$

From this equation we obtain the torque speed characteristic as



In a series wound DC motor, the speed varies with load. And operation wise this is its main difference from a shunt wound DC motor.

Shunt Wound DC Motor



Shunt Excited DC Motor

In case of a **shunt wound DC motor** or more specifically shunt wound self excited DC motor, the field windings are exposed to the entire terminal

voltage as they are connected in parallel to the armature winding as shown in the figure below.

To understand the characteristic of these types of DC motor, lets consider the basic voltage equation given by,

$$E = E_b + I_a R_a \quad \cdots\cdots\cdots\cdots\cdots\cdots (1)$$

[Where, E, E_b, I_a, R_a are the supply voltage, back emf, armature current and armature resistance respectively]

$$Now,\ E_b = k_a \phi \omega \quad \cdots\cdots\cdots\cdots\cdots\cdots (2)$$

[since back emf increases with flux φ and angular speed ωω]

Now substituting E_b from equation (2) to equation (1) we get,

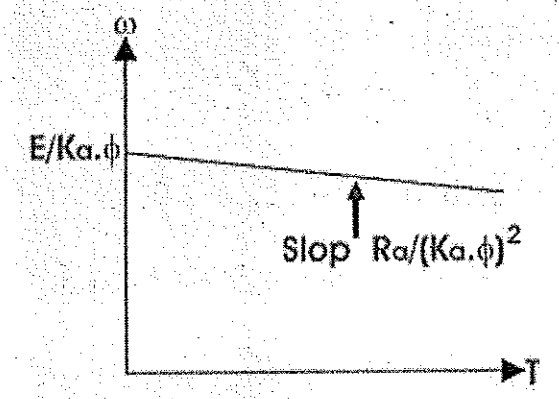
$$E = k_a \phi \omega + I_a R_a$$

$$\therefore \omega = \frac{E - I_a R_a}{k_a \varphi} \text{---------(3)}$$

The torque equation of a DC motor resembles,

$$T_g = K_a \phi I_a \quad \cdots\cdots\cdots\cdots\cdots\cdots (4)$$

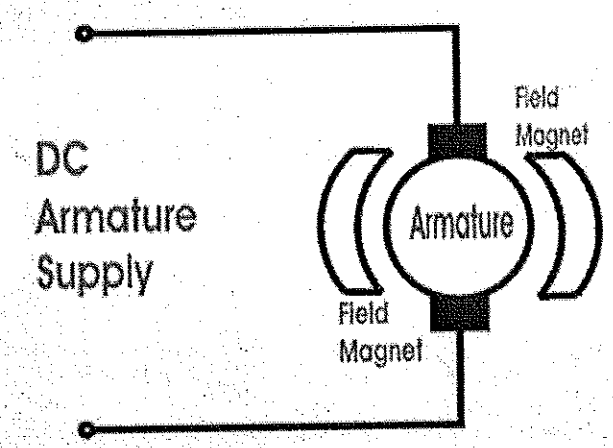
This is similar to the equation of a straight line, and we can graphically representing the torque speed characteristic of a shunt wound self excited DC motor as



The shunt wound DC motor is a constant speed motor, as the speed does not vary here with the variation of mechanical load on the output.

3. What do you understand by permanent magnet DC motor?

Solution: Permanent Magnet DC Motor



Permanent Magnet DC Motor

The **permanent magnet DC motor** (also known as a PMDC motor) consists of an armature winding as in case of an usual motor, but does not necessarily contain the field windings. The construction of these types of DC motor are such that, radially magnetized permanent magnets are mounted on the inner periphery of the stator core to produce the field flux.
The rotor on the other hand has a conventional DC armature with commutator segments and brushes. The diagrammatic representation of a permanent magnet DC motor is given below.
The torque equation of DC motor suggests

$$T_g = K_a \varphi I_a$$

Here φ is always constant, as permanent magnets of required flux density are chosen at the time of construction and can't be changed there after.
For a permanent magnet DC motor

$$T_g = K_{a1} I_a$$

Where, $K_{a1} = K_a.\varphi$ which is another constant. In this case, the torque of DC Motor can only be changed by controlling the armature supply.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Electrical Skills

Session: 2021-22 (Summer Semester)

B. Voc. ELE Program, III Semester,

2nd In-Sem. Examination

Course Code: ELE1307 **Time: 1 Hour**

Course Name: Electric Circuit & Drawing **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

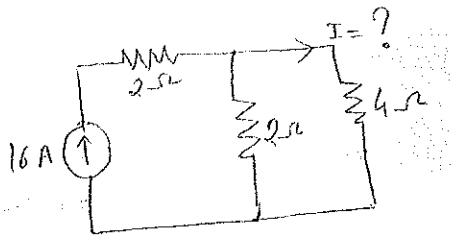
05X01 = 05 Marks

1. Which of the following impression of Ohm's law is not correct:
   (a) V=I*R (b) I=V/R (c) R=V/I (d) I=R/V
2. KCL works on the principle of:
   (a) Charge conservation (b) Energy conservation
   (c) Power conservation (d) None of these
3. Unit of Power is:
   (a) Kwh (b) Joules (c) Watt (d) All of these
4. Transformer is a:
   (a) Active device (b) Passive device
   (c) Rotating device (d) None of these
5. Current source is deactivated as:
   (a) Short Circuit (b) Open Circuit
   (c) Always active, never deactivated (d) None of these

Section – B

03X02 = 06 Marks

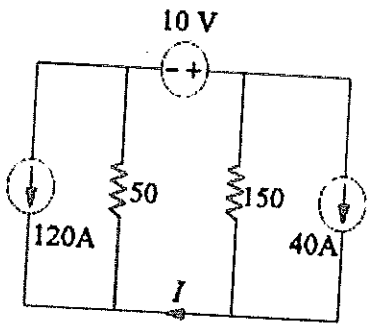
1. Write the statement of Thevenin's theorem and also draw its equivalent diagram.
2. State the law of conservation of energy and also define conditions when current will flow in a circuit.
3. Use current division rule, and calculate the value of the current in 4-ohm resistor:



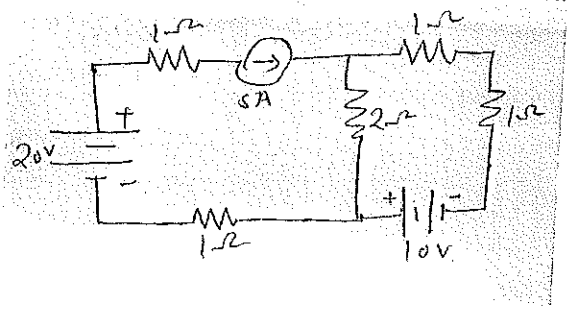
Section – C

03X03 = 09 Marks

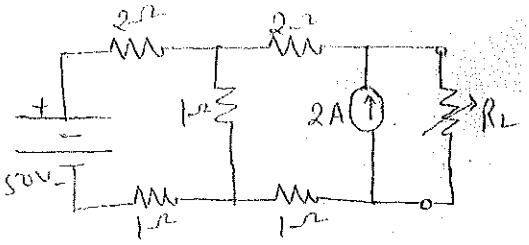
1. Calculate the value of I using Superposition theorem:



2. Calculate the current in 2-ohm resistor using Thevenin model:



3. Find the value of R_L for which the maximum power can be transferred to it:



Answer Key

Course Code: ELE1307, Course Name: Electric Circuit & Drawing

School of Electrical Skills, 3rd Semester, 2nd In-Sem. Examination

B. Voc. Program, Summer Semester (2021-22)

Section - A

A.1 d

A.2 a

A.3 c

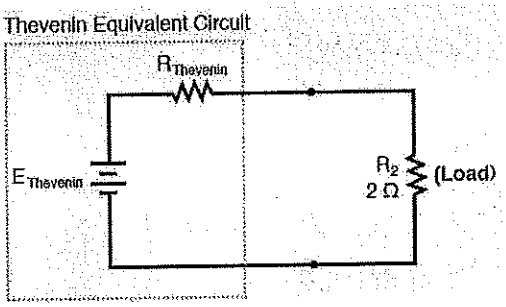
A.4 b

A.5 b

Section-B

Ans.1

Thévenin's theorem states that "For any linear electrical network containing only voltage sources, current sources and resistances can be replaced at terminals A–B by an equivalent combination of a voltage source V_{th} in a series connection with a resistance R_{th}."



Ans.2

☆ Law of Conservation of Energy :-

The law of Conservation of energy states that energy can neither be created nor destroyed - only converted from one form of energy to another.

☆ Conditions to flow of current :-

3 conditions are important & are as follows :-

- There should be atleast one independent source in the circuit.
- There should be atleast one closed path in the circuit
- Return path to the current is must.

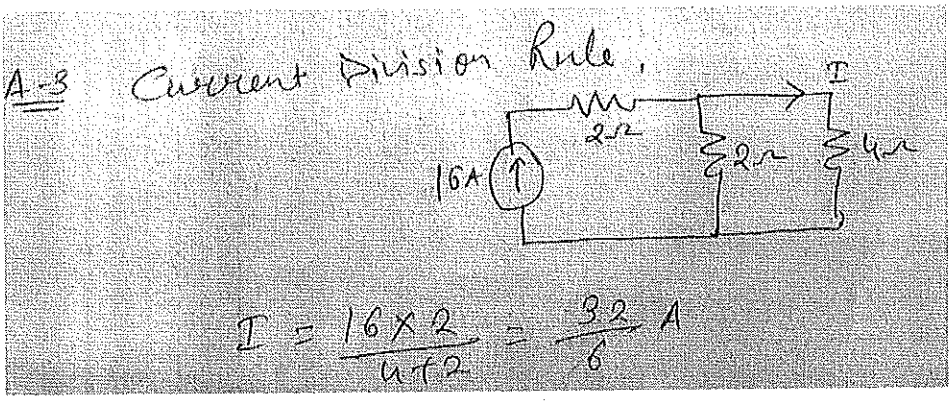
Answer Key

Course Code: ELE1307, Course Name: Electric Circuit & Drawing

School of Electrical Skills, 3rd Semester, 2nd In-Sem. Examination

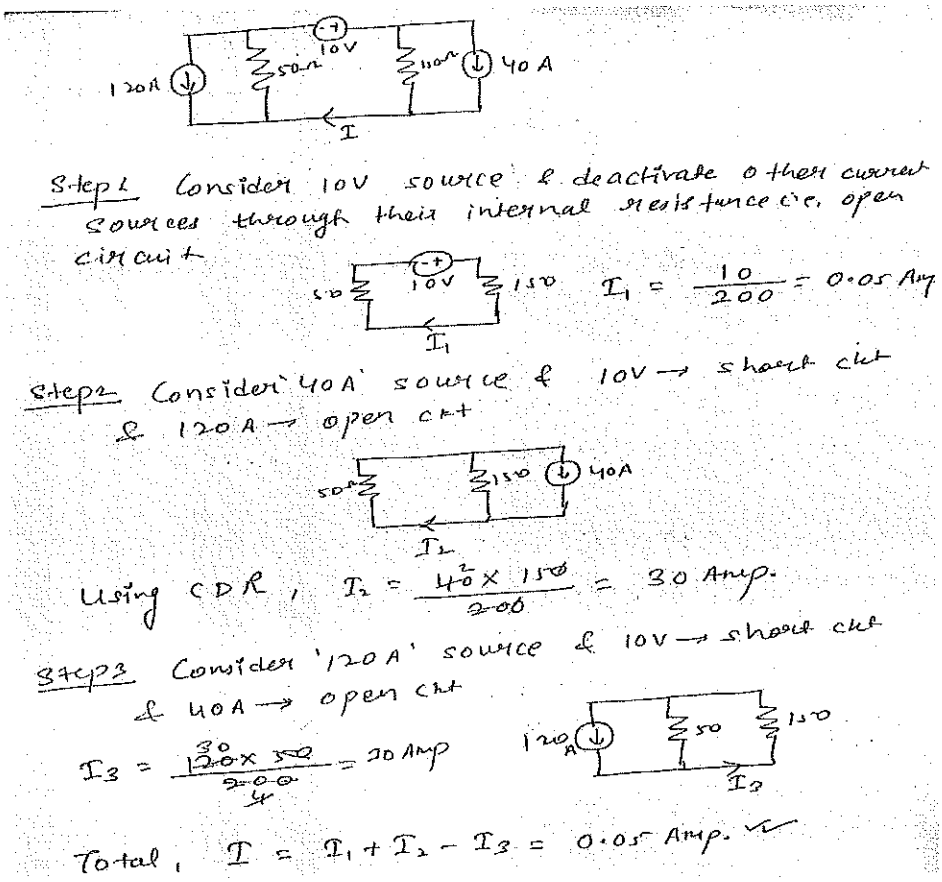
B. Voc. Program, Summer Semester (2021-22)

Ans.3



Section-C

Ans.1



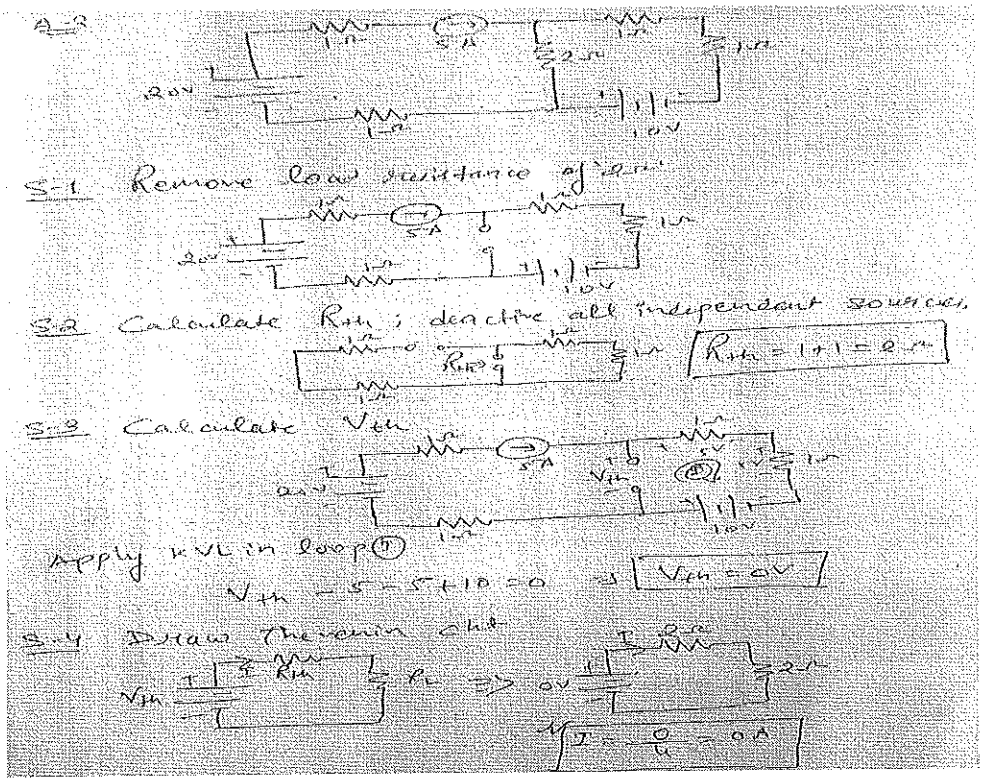
Answer Key

Course Code: ELE1307, Course Name: Electric Circuit & Drawing

School of Electrical Skills, 3rd Semester, 2nd In-Sem. Examination

B. Voc. Program, Summer Semester (2021-22)

Ans.2



Ans.3