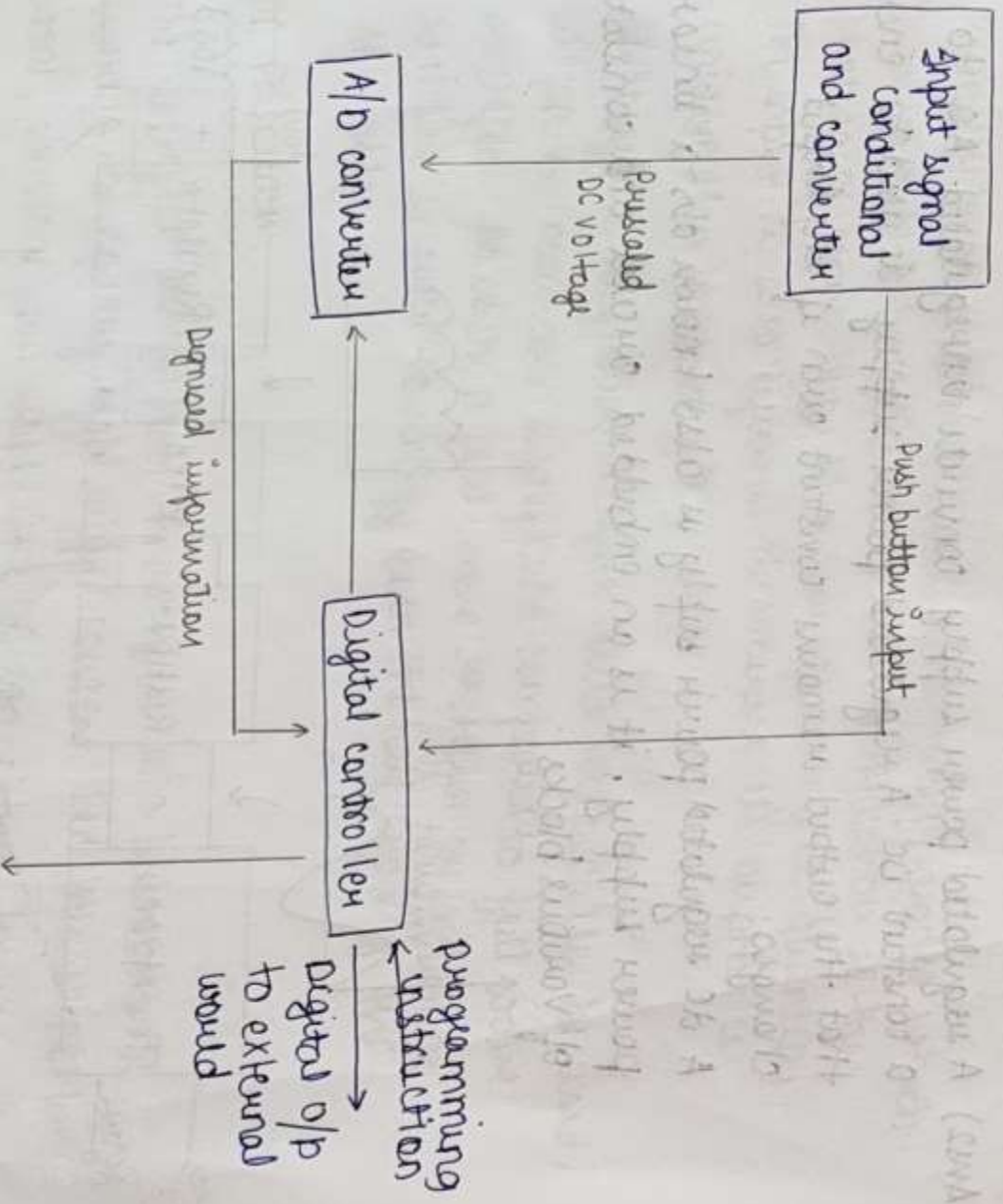


BXE Assignment

Ans-1 A digital multimeter is a tool used to measure two or more electrical values - principally voltage (volts), current (amps) and resistance (ohms). It is a standard diagnostic tool for technicians in the electrical/electronic industries.

Block Diagram



WORKING:

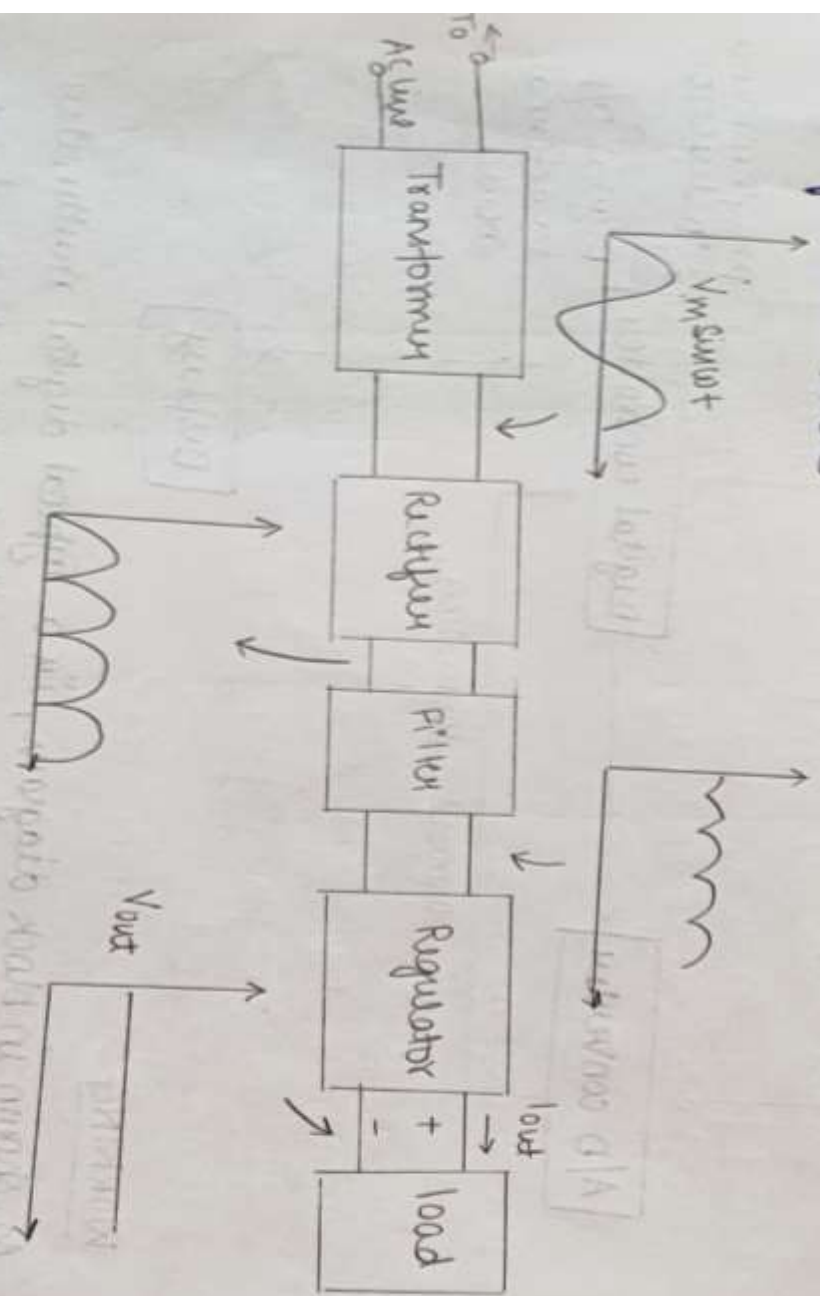
As shown in block diagram, in a typical digital multimeter the input signal i.e. ac or dc voltage, current, resistance, temperature or any other parameter is converted to dc voltage within the range of ADC. The analog to digital converter then converts the pre-scaled dc voltage into its equivalent digital numbers which will be displayed on the display unit.

Sometimes, digital controller block is implemented with a microcontroller or a microprocessor manages the flow of information within the instrument. This block will coordinate all the internal function as well as transferring information to external devices, such as printers or personal computers.

In the case some handheld multimeter, some of or all of these blocks may be implemented in a VLSI circuit while A/D converter and display driver can be in the same IC.

Ans2) A regulated power supply converts unregulated AC to a constant DC. A regulated power supply is used to ensure that the output remains constant even if the input changes.

A dc regulated power supply is also known as a linear power supply, it is an embedded circuit and consists of various blocks.



Block Diagram

WORKING:

1) Step Down Transformer

A step down transformer will step down the voltage from the AC main to the required voltage level. The turn ratio of the transformer is adjusted such as to obtain the required voltage value. The output of the transformer is given as an input to the rectifier circuit.

2) Rectification

Rectifier is an electronic circuit consisting of diodes which converts out the rectification process. Rectification is the process of converting AC to corresponding DC quantity. The input to a rectifier is AC whereas its output is unidirectional pulsating DC.

Although a half wave rectifier could technically be used, its power losses are significant compared to full wave rectifier. As such, a full wave rectifier or a bridge rectifier is used to rectify both the half cycle of the AC supply.

3) DC Filtration

The rectified voltage from the rectifier is a pulsating DC voltage having very high ripple content. But this is not we want, we want pure supply pure DC waveform. Hence a filter is used.

As the instantaneous voltage starts increasing the capacitor charges, it charges until the waveform reaches its peak value. When the instantaneous value starts reducing, the capacitor starts discharging exponentially slowly through load. Hence, an almost constant DC value having very less ripple content is obtained.

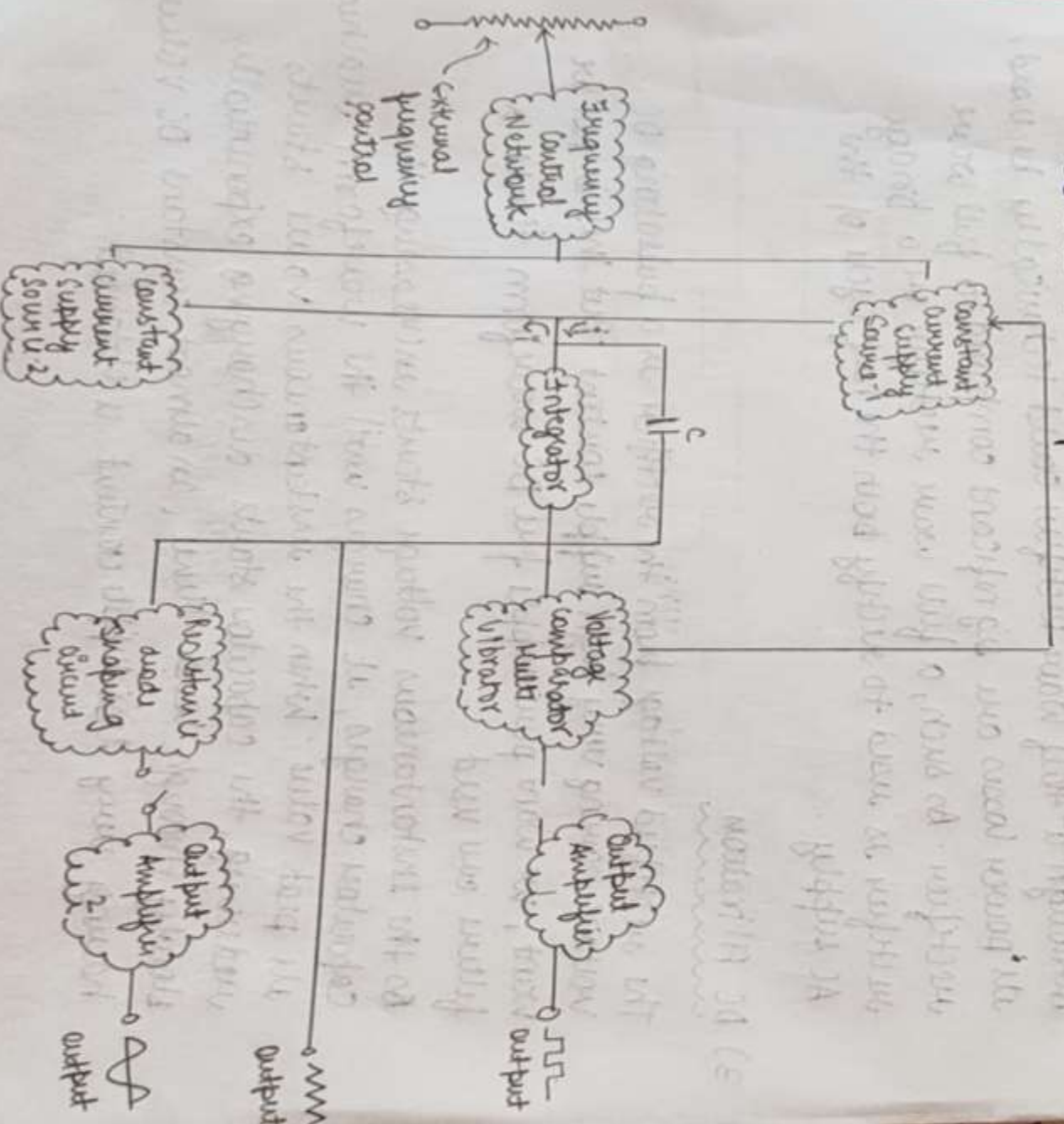
4) Regulation

This is the last block in a DC regulated power supply. The output voltage or current will change when there is a change in input from AC mains. This problem can be eliminated by using a regulator. A regulator will maintain the output constant even when changes at input occur.

Ans) A function generator is a signal source that has capability of producing different types of waveforms as its output signal.

Principle

Simple function generator usually generates triangular waveform whose frequency can be controlled smoothly as well as in step.



Block Diagram

WORKING:-

The block diagram of a function generator is given in the figure. In this instrument, the frequency is controlled by varying the magnitude of the current that drives the integrator. This instrument provides different types of waveform as its output signal with a frequency range of 0.01 Hz to 100 kHz.

The frequency controlled voltage regulates two current supply sources. Current supply source 1 supplies a constant current to the integrator whose output voltage varies linearly with time. An increase or decrease in the current increase or reduces the slope of the output voltage and thus control the frequency.

The voltage comparator multivibrator changes states at a predetermined maximum level of the integrator's output voltage. This change cut-off the current supply from source 1 and switches to supply source 2. The current supply source 2 supplies a reverse current to the integrator so that its output drops linearly with time. When output attains a predetermined level, the voltage comparator again changes to state and switches on to the current supply source. The output of a integrator is a triangular wave whose frequency depends on the current supplied by the constant current supply source.

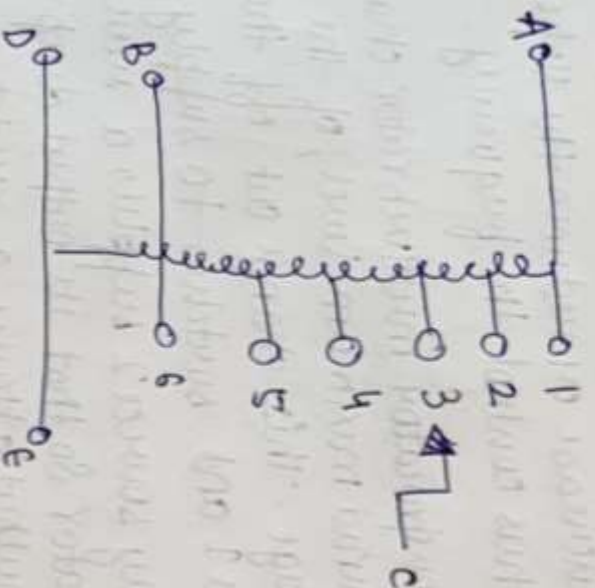
DT.

A DC voltmeter is constructed by connecting the weight in series this instrument and also a very high resistor in parallel with the circuit whose want to measure the voltage. Dynamo meter type moving coil instrument consists of two coils one is fixed and other is rotating. The interaction of the two field coil and moving coil produces a deflecting torque. These are used in DC measurement to very circuit only this make this instrument to very usage.

Ques

The working principle of autotransformer and construction is similar to that of conventional two winding transformers. However, it differs in the way in which the primary and the secondary are inter related.

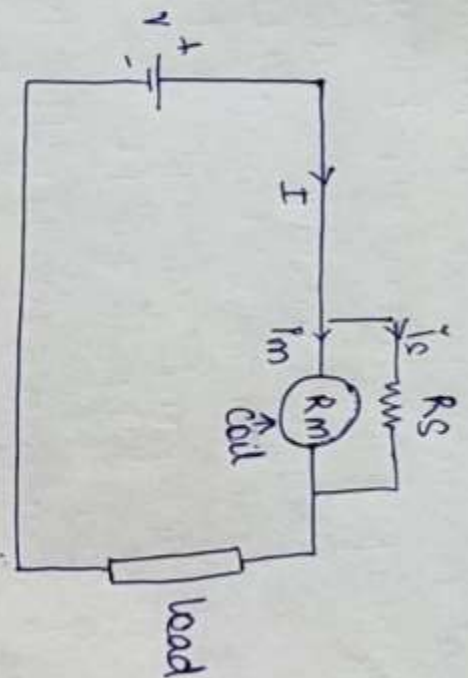
The autotransformer winding are connected electrically as well as magnetically. It consists of only one winding wound on a laminated magnetic core, with a suitably movable contact. The same autotransformer can be used as a stepdown or a step up transformer.



WORKING

- When the single phase AC supply is connected between A and D terminals and output is taken from C & E terminals, this auto transformer will operate as a step down transformer.
- On the other hand when the single phase AC supply is connected b/w B & D terminals and output is taken from C & E terminals, the same autotransformer will operate as step-up transformer.

Ans a) A DC ammeter is a device to measure DC current. Typically it consists of a coil wound surrounded by a fixed magnet, the winding itself is linked to pivoting vanes which is the indicator needle for the current meter. So, the voltage across this shunt resistance is linearly proportional to measured current meter. Range extension of Ammeter by shunt. This shunt provides a path for extra current because it is connected across the instrument. This shunted instrument can be used to measure current many times greater than the normal full scale deflection current.



$$I = I_S + I_m \Rightarrow I_S = I - I_m$$

Since a shunt is in parallel with ammeter.

$$I_S R_S = I_m R_m$$

$$R_S = \frac{I_m R_m}{I_S} = \frac{I_m R_m}{I - I_m}$$

$$\boxed{N = 1 + \frac{R_m}{R_S}}$$

Ans b) As we know that

$$I = I_g \left(1 + \frac{R_g}{S} \right)$$

So, by this formula-

$$2 = 2 \times 10^{-3} \left(1 + \frac{25}{S} \right)$$

$$999 \times \frac{25}{S} \Rightarrow S = \frac{25}{999} \Rightarrow S \approx 0.025 \Omega.$$

4) The cathode-ray oscilloscope (CRO) is a common laboratory instrument that provides accurate time and amplitude measurements of voltage signals over a wide range of frequencies. The reliability, stability and ease of operation makes it suitable as a general purpose laboratory instrument. A general purpose oscilloscope consists of the following parts:

- 1) Cathode ray Tube
- 2) Vertical amplifier
- 3) Delay line
- 4) Time base generator
- 5) Horizontal amplifier
- 6) Trigger circuit
- 7) Power supply

- Cathode Ray tube: It is the heart of the oscilloscope. When the electrons emitted by the electron gun strikes the phosphorous screen, a visual signal is displayed on CRT.

- Vertical amplifier: The input signals are amplified by the vertical amplifier. Usually, the vertical amplifier is a wide band amplifier which passes the entire band of frequencies.

- Delay line:- As the name suggests, this circuit is used to delay the signal for a period of time in, the vertical section of CRT. The input signal is not applied directly to the vertical plates because the part of the signal get lost, when the delay time is not used. Therefore, the input signal is delayed by a period of time.

- Time base generator:- Time base circuit uses a uni-junction transistor, which is used to produce the sweep. The saw both voltage produced by the time base circuit is required to deflects the beam in the horizontal section. The spot is deflected by the both voltage at a constant time dependent rate.

- Horizontal Amplifier:- The saw-tooth voltage produced by the time base circuit is amplified by the horizontal amplifier before it is applied to horizontal deflection plates.

- Power supply:- The voltage required by ERT, horizontal amplifiers and vertical amplifiers are provided by

11 Negative high voltage

→ The voltage of negative high voltage

→ The voltage of positive low voltage supply from 300 to 400V.

- (iv) The cursor measurement is possible.
- v) The character can be displayed on screen along with the waveform which can indicate waveform information such as min, max, frequency, amplitude etc.
- vi) The X-Y plot, BH curve, PV diagram, can be displayed.
- vii) The free-trigger viewing feature allows to display the waveforms before trigger pulses.
- viii) Keeping the records is possible which includes the translating raw data into finished information.

Disadvantage of DSO:-

- i) Oscilloscope cost more than other types of electronic measurement instruments such as multimeter.
- ii) They tend to be very complex in operation.
- iii) They are very costly to repair if damaged. As there is no storage memory available if can only analyse signal in real time.

Application of DSO:-

- 1) Take cursor and pulse width reading.
- 2) Measuring rise time and frequency delay.
- 3) Implementing maths function like subtraction and addition.
- 4) Acting as a simple signal tracer, a DSO enables technician to electronic devices individual components and components to determine the malfunctioning part.