DEPARTMENT OF HUMANITIES & APPLIED SCIENCES

1FY3-08: BASIC ELECTRICAL ENGINEERING

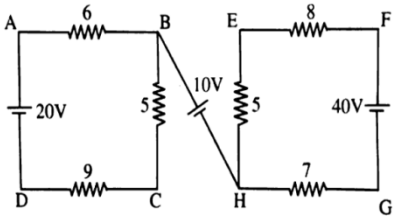
GUESS PAPER (Session: 2025-26)

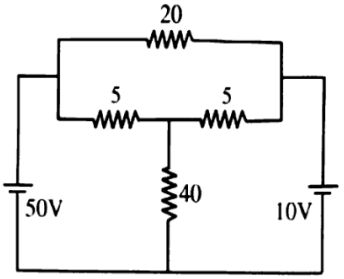
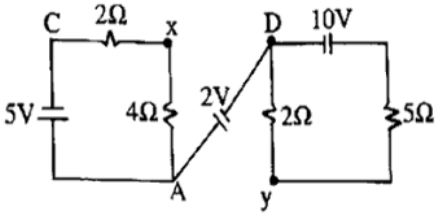
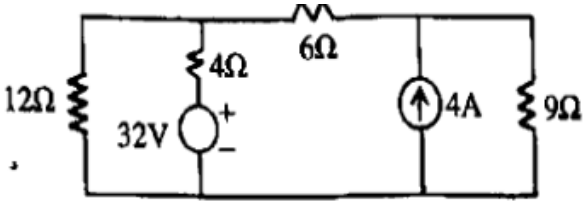
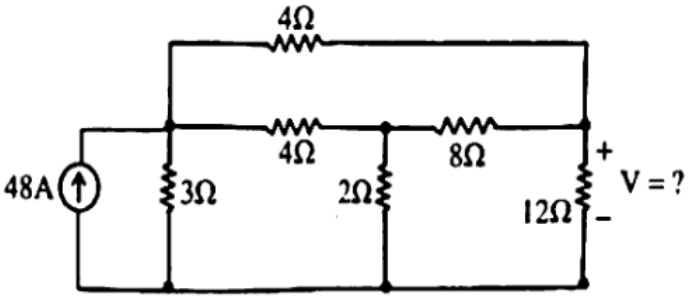
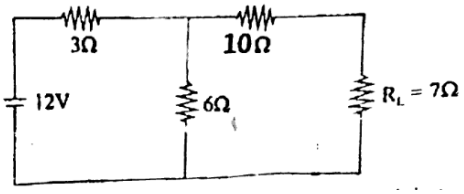
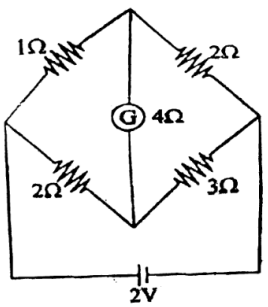
UNIT-01: DC CIRCUITS

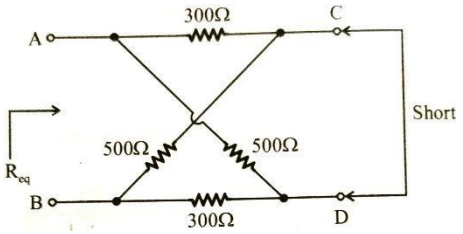
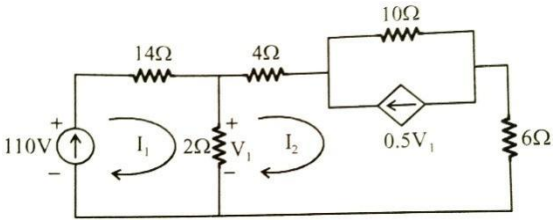
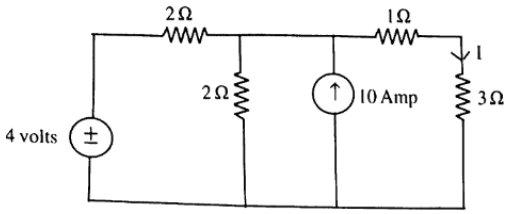
(Short Answer Type)

Q.No.	Question
1	What is current.
2	Explain Kirchoff's current law & Kirchoff's voltage law.
3	If N equal resistances are connected in series and then in parallel calculate the ratio of equivalent rsistance between them.
4	Explain the concept of voltage and current source transformation with an example.
5	Write down different types of energy sources.
6	Explain different types of circuit elements.
7	State & explain Ohm's law.
8	Explain the source transformation technique with suitable example.

(LONG ANSWER TYPE)

Q.No.	Question
1	Explain Maxwell's loop current method with the help of an example.
2	Explain the node voltage method with the help of an example.
3	State Thevnin's theorem in exact words. Under what conditions, the thevnin's theorem is not applicable.
4	For the circuit shown in fig. find V_{CE} and V_{AG}. 
5	Use superposition theorem to find current in 40ohm, in the network shown:

	
6	**Find voltage V_{XY} in the given network:** 
7	**Compute the power dissipated in 9Ω resistor using superposition theorem:** 
8	**Using nodal analysis, find the voltage across 12Ω resistance in the following circuit:** 
9	**Find the current in R_L= 7Ω resistor using Thevnin's theorem:** 
10	**Calculate the current through the galvanometer. (Using Mesh Analysis)** 
11	**Mathematically, Prove the condition for maximum power transfer theorem.**
12	**Find the equivalent resistance of the network shown below (a) when terminals CD are open (b) when terminals CD are short.**

	
13	**Find the current I_1, I_2 and V_1 in the circuit shown in fig:** 
14	**Determine the current I through 3Ω resistor using Norton's theorem.** 

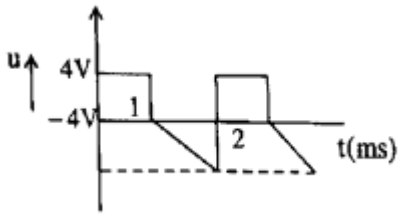
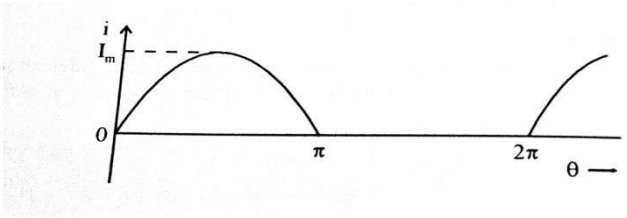
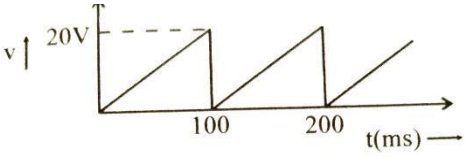
UNIT-02: AC CIRCUITS

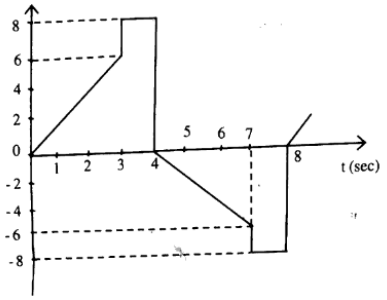
(Short Answer Type)

Q. No.	Question
1	Explain the phasor representation of power.
2	What is resonance? Derive the formula of resonance frequency.
3	Define the following terms related to AC: (a) Amplitude (b) Frequency (c) Time Period (d) Cycle
4	Write short note on: (a) Average Value (b) RMS Value (c) Form Factor (d) Peak Factor
5	Explain the meaning of phase, phase difference, lagging wave and leading wave as regards to AC.
6	What is the significance of reactive power.

(Long Answer Type)

Q. No.	Question
1	An alternating voltage is given by V= 230sin 314t. Calculate frequency and maximum average & RMS value of voltage.

2	**Determine the power factor of a series RLC circuit with R = 5 Ω , X_L = 8 Ω and X_C = 12 Ω.**
3	**Calculate the RMS and average value of the voltage wave shown in fig.** 
4	**Derive the expression of Impedance and current for a series R-L-C circuit with the help of circuit diagram , also draw the phasor diagram under the following conditions:** **(a) $X_L > X_C$ (b) $X_C > X_L$ (c) $X_C = X_L$**
5	**Draw the circuit diagram and phasor diagram of 3-phase star connected circuit, and explain the relationship between line voltage and phase voltage and Line current and Phase current.**
6	**Draw the circuit diagram and phasor diagram of 3-phase delta connected circuit, and explain the relationship between line voltage and phase voltage and Line current and Phase current.**
7	**Find the RMS value, average value, form factor and peak factor of a half rectified current wave.** 
8	**For a single phase sinusoidal waveforms, determine the average and rms values in terms of maximum value.**
9	**A circuit consists of the following in parallel (a) A resister of 500 ohms (b) An inductor of 2H (c) A capacitance of 10μF. A source voltage of 200v, 50Hz is applied. Determine the current from the supply, complex power, active power, reactive power and power factor of the circuit.**
10	**A periodic voltage waveform has been shown in fig.**  **Determine:** **(a) frequency of the waveform** **(b) wave equation for 0<t<100** **(c) RMS Value** **(d) Average value and form factor.**
11	**Two coils A and B are connected in series across a 240V, 50Hz supply. The resistance of A is 5ohm and inductance of B= 0.015H. If the input from the supply is 3KW and 2KVAR. Find the inductance of A and resistance of B. Calculate the voltage across each coil.**

12	**If an AC supply of 100V, 50Hz is connected across a load of impedance, 4+j8 ohms. Calculate the current flowing through the circuit, active power, apparent power, reactive power and power factor.**
13	**A voltage wave has the variation as shown in fig: Determine:** **(a) The average and RMS value of voltage** **(b) If the voltage of Part(I) is applied to a 50Ω resistor. Find power dissipated in watts.** 
14	**In a series circuit containing pure resistance and a pure inductance the current and voltage are expressed as:** **i(t) = 5** $\sin sin\,(314t + \frac{2\pi}{3})$ **and v(t) = 15** $\sin sin\left(314t + \frac{5\pi}{6}\right)$**.** **Determine: (a) Impedance of the circuit (b) Value of resistance (c) Value of inductance (d) Average power drawn by the circuit (e) power factor**
15	**An inductive load is connected in series with a non-inductive resistance of 8.0Ω. The combination is connected across an ac supply of 100V, 50 Hz. A voltmeter is connected across the non-inductive resistor and then across the inductive load gives the readings of 64V and 48V respectively.** **Determine the following: (a) Current in the circuit (b) Impedance of the combination (c) Power absorb by the resistor (d) total power absorb (e) Power factor of the load (f) Power factor of the whole network.**
16	**A 100Ω resistance is connected in series with a choke coil. When a 440V, single phase alternating voltage is applied to this combination, the voltage across the resistance and choke coil are 200 V and 300V respectively. Calculate:** **(a) Resistance and inductance of choke coil.** **(b) Total impedance and resistance of the circuit.** **(c) Power absorb by the coil and circuit.**

UNIT-03: ELECTRICAL MACHINES

(Short Answer Type)

Q. No.	Question
1	**State the torque-slip characteristics of induction motor.**
2	**Discuss the transformer emf equation.**

3	Explain working principle of induction motor.
4	What is an ideal transformer.
5	What are different parts of DC machine.
6	What are transformer losses.
7	What is eddy current loss and how can be this loss be reduced.
8	What is meant by slip of induction motor?
9	Give reason why Rating of transformer in KVA/MVA?
10	Explain why core of transformer is laminated?
11	State Faraday's law & Lenz's law.

(Long Answer Type)

Q. No.	Question
1	Describe the constructional details of single phase transformer.
2	With a neat circuit diagram, explain the construction and principle of operation of DC machine.
3	A 8 pole DC machine has a wave winding containing 600 conductors. Calculate the generated emf when the flux per pole is 0.08wb and speed is 215 rpm. If the flux per pole is made 0.05wb. At what speed should the armature be drawn to generate 500V?
4	A 200 kVA, 3300/240V, 50Hz single phase transformer has 80 turns on secondary winding. Assume an ideal transformer calculate: (i) Primary and secondary current on full load (ii) The maximum value of flux (iii) No. of primary turns.
5	A 125kVA transformer having voltage of 12500 volts at 50Hz has primary 400 primary and 50 secondary turns. Assume an ideal transformer, Calculate: (i) The full load primary and secondary current (ii) Secondary induced emf (iii) The maximum flux in core.
6	Derive emf equation of single phase transformer. Also explain that why transformer is known as constant flux device.
7	Explain in details the construction and principle of working of a three phase induction motor.
8	State Faraday's laws of electromagnetic induction and explain the difference between dynamic and static induced emf.
9	What is ideal transformer. With the help of necessary diagram explain the working principle of ideal transformer.
10	Draw and explain the Torque - Slip characteristics of Induction motor, also explain various significance of Torque – slip characteristics of induction motor.

11	Draw phasor diagram of ideal transformer at On-Load.
12	Explain the working principle of 3-phaase synchronous machine with neat and clean diagram.

UNIT-04 (POWER CONVERTERS)

(Short Answer Type)

Q. No.	Question
1	What is BJT?
2	What is Silicon Controlled Rectifier.
3	What are different types of transistors.
4	Define diode, draw and explain V-I Characteristics of diode.
5	Define α, β and γ of a transistor and also derive the relationship between them.
6	Define the following: a) Reverse saturation current b) Holding current c) Latching current
7	Distinguish between rectifier and an inverter.
8	Define Semi conductor , explain various types of semi conductor.
9	Explain the formation of diode.

(Long Answer Type)

Q. No.	Question
1	Explain IGBT in detail with neat diagram.
2	Derive the expression for ripple factor and efficiency of a half wave rectifier.
3	What is SCR? Sketch static I-V characteristics of a thyristor. Label the various voltages, current and operating modes on this sketch.
4	Explain the working of a single-phase full bridge inverter with the help of circuit diagram and output voltage waveform.
5	Define chopper, draw the circuit diagram and explain the working of chopper circuit.
6	Define Inverter, draw the circuit diagram and explain the working of inverter circuit.

7	Explain the working of 1- phase half wave rectifier with the help of circuit diagram and waveform. Obtain the expression of average value and RMS value of output current and voltage.
8	Explain the working of 1- phase full wave rectifier with the help of circuit diagram and waveform. Obtain the expression of average value and RMS value of output current and voltage.
9	Explain the working of BJT with proper steps and neat and clean diagram.
10	Explain the working of a single-phase half bridge inverter with the help of circuit diagram and output voltage waveform.

UNIT-05 (ELECTRICAL INSTALLATION)

(Short Answer Type)

Q. No.	Question
1	Define the following terms: (a) SFU (B) MCB
2	Explain the role of MCCB in the electrical system installation.
3	Explain the role of ELCB in the electrical system installation.
4	Define the role of following protective equipments: (a) Isolator (b) Circuit Breaker (c) Lightning Arrestor (d) C.T. & P.T. (e) power Transformer
5	Define switchgear and explain different switchgear according to different voltage levels.
6	Discuss three wattmeter method for power measurement.

(Long Answer Type)

Q. No.	Question
1	With suitable example, explain calculation for energy consumption.
2	Explain different types of Earthing with suitable example.
3	Why protective devices are used for over load and short circuit protection? Why do we use an ELCB in an electrical installation.
4	Calculate the energy consumed per month by the following loads; (i) 4 tube light of 40W used on an average 8 hours per day. (ii) 3 fans of 8 W used on an average of 10 hours per day. (iii) 1 fridge of ¼ kW rating operating 12 hours per day. The supply voltage is 230V, 50Hz. Also calculate the electricity bill if cost of one unit of energy is Rs. 5/- only.
5	Write short notes on: (a) MCB (b) Layout of LV switchgear
6	Explain the two wattmeter method to obtain the total power measured and power factor with proper circuit diagram and phase diagram.

<table>
<tr><td>7</td><td>Connected appliances and their usage hours of a domestic consumer is shown in table. Assuming rate of electricity consumption is 5.6 Rs/KWh, find the expected energy cost of the consumer.
<table>
<tr><th>S.No.</th><th>Electric Appliances</th><th>Rating (Watts)</th><th>Number of Appliances</th><th>Usage (Hours)</th></tr>
<tr><td>1.</td><td>CFL Bulbs</td><td>15</td><td>10</td><td>5</td></tr>
<tr><td>2.</td><td>Fan</td><td>100</td><td>5</td><td>10</td></tr>
<tr><td>3.</td><td>TV</td><td>40</td><td>2</td><td>3</td></tr>
<tr><td>4.</td><td>Microwave</td><td>700</td><td>1</td><td>0.5</td></tr>
</table></td></tr>
<tr><td>8</td><td>Two wattmeter connected to read the total power in a 3-Phase system supplying a balanced load read 10.5kW and -2.5kW respectively. Calculate the total power and power factor. Explain the significance of (i) equal wattmeter readings and (ii) a zero reading on one wattmeter.</td></tr>
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