

**Unit 3 Single phase A.C. Circuits**

1. Derive the expression for instantaneous current, power consumed & sketch relevant waveform when voltage of  $v = V_{max} \sin(\omega t)$  is applied to a circuit consisting of \_\_\_\_\_,  
i. Pure resistance      ii. Pure inductance      iii. Pure capacitor.
2. write the expression for instantaneous current & sketch relevant waveform when voltage of  $v = V_{max} \sin(\omega t)$  is applied to a circuit consisting of  
i) R-L circuit ii) R-C circuit  
Draw relevant phasor diagram showing current and voltage.

**(Do not get confused between Q1 and Q2 questions)**

3. Define the following terms with their **units**,
  - a. Active power
  - b. Reactive power
  - c. Apparent power
  - d. Impedance
  - e. Power factor
4. What is impedance triangle and power triangle? Explain with reference to a) R-L circuit b) R-C circuit  
c) RLC series circuit
5. Derive the expression of active power or power consumed when alternating voltage of  $v = V_{max} \sin(\omega t)$  is applied to a series a) R-L circuit b) R-C circuit.
6. Sketch & explain phasor diagrams for RLC series circuit when
  - a.  $X_L > X_C$
  - b.  $X_L < X_C$
  - c.  $X_L = X_C$ .

Also derive equation for resonance frequency

7. Define the following terms with their units,
  - a. Admittance
  - b. Susceptance
  - c. Conductance
8. Draw admittance triangle for parallel circuit where branch-1 contains RL in series & where branch-2 contains RC in series.
9. What is admittance? Obtain its components and their units. Draw admittance triangle for RL and RC circuit.

## Unit 4- Polyphase A.C. Circuits and Single Phase Transformer

### **Polyphase A.C. Circuits**

1. Give the advantages of 3-phase system over 1-phase system.
2. Explain the following terms,
  - a. Symmetrical system
  - b. Unsymmetrical system
  - c. Phase sequence
  - d. Balanced load
  - e. Unbalanced load
  - f. Line voltage
  - g. Phase voltage
  - h. Line current
  - i. Phase current
3. Derive relationship between line current & phase current, between line voltage & phase voltage for a balanced 3-phase (a) delta connected inductive load (b) star connected capacitive load across 3-phase supply. Also derive the expression for active power & reactive power in terms of line current & line voltage. (**If type of load is mentioned ,then both voltage and current phasors should be there**)
4. Prove that 3-phase balanced load draws 3 times as much as power when conned in delta as it would draw when connected in star.

### **Single Phase Transformer**

1. Explain working principle of transformer.
2. Give the constructional details of transformer in brief.
3. With neat sketches, explain the various types of lamination used for the construction of core of single phase transformer.
4. What is transformation ratio of a transformer? What do you mean by step up and step down transformer.
5. Compare shell type & core type of transformers.
6. Derive the EMF equation of transformer.
7. What are the losses in the transformer, where they occur, & how to minimize these losses?
8. Explain in brief hysteresis and eddy current losses. List the factors on which it depends.
9. Explain with experimental setup method of determination of efficiency & voltage regulation of 1-phase transformer by direct load test. (Ans. should include circuit diagram, procedure, observation table, definition & formulae's of efficiency & voltage regulation, and graphs of "efficiency" Vs 'Output power' & 'voltage regulation' Vs 'Output power'.)
10. Write short note on auto-transformer or dimmerstat.( circuit diagram , working , advantages disadvantages and applications)

## Unit 5 - D. C. Circuits

1. Give the classification electrical network with examples wherever possible.
2. Represent the following by their symbols
  - i) Ideal and practical voltage source
  - ii) Ideal and practical current source
3. State & explain Kirchhoff's law.
4. State & illustrate Superposition theorem. (**Do not solve numerical for illustration**)
5. State & illustrate Thevenin's theorem. (**Do not solve numerical for illustration**)
6. Derive the formulas to convert star connected network into its equivalent delta connected network & vice-versa.

## Unit 6– Work Power Energy and Batteries

### **Work ,Power and Energy**

1. Define the terms resistance, specific resistance (resistivity) and conductance of a material. State their units.
2. State the factor on which resistivity depends.
3. What is the effect of temperature on metals, alloys ,insulators and semi conductors?
4. Define the resistance temperature co-efficient of a conducting material and its unit.
5. Define resistance temperature coefficient & state its unit. Derive expression for,  
$$\alpha_2 = \alpha_1 / [1 + \alpha_1(t_2 - t_1)]$$
  
(variations of this expression may be asked .)
6. What is insulation resistance? Give four examples of insulating materials. What is the effect of temperature and moisture on insulating material?
7. Derive expression of insulation resistance for single core cable.
8. Definitions and concept related to work power and energy.

### **Battery and cells**

1. Distinguish between cell and a battery.
2. Distinguish between primary cell and secondary cell.
3. With neat sketch explain construction and working of lead acid cell. Write down the changes taking place during the charging of lead acid cell. Write & explain the chemical equations.
4. Describe the method of charging storage batteries. What are the indications which confirm that a Lead Acid cell is fully charged?
5. Enlist the aspects of maintenance and the precaution to be observed of Lead Acid batteries, so that these give efficient service over a longer life.

6. With neat sketch explain construction and working of lithium ion cell.
7. State advantages and disadvantages of lithium ion battery.
8. List out important applications of lithium ion battery.
9. Explain the factor which affects battery capacity.
10. Explain the concept of depth of discharge (DoD) of a battery.
11. If four cells, each rated for 2V, 0.15A connected as batteries in three different ways. Find voltage and current rating of each type.

***All the best !!!***