CAPACITOR :

QUES. DERIVE THE CAPACITOR OF COAXIAL CABLE OF LENGTH L HAVING THE SHAPE OF A CYLINDER WITH RADIUS A AND OUTER RADIUS B.

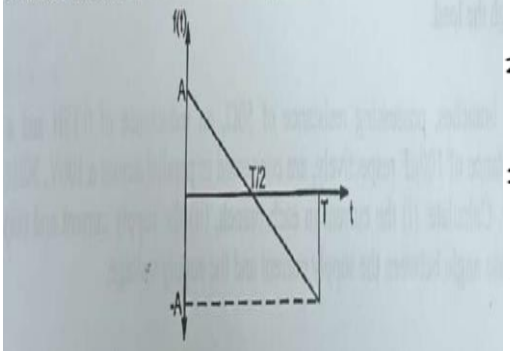
SINGLE PHASE AC

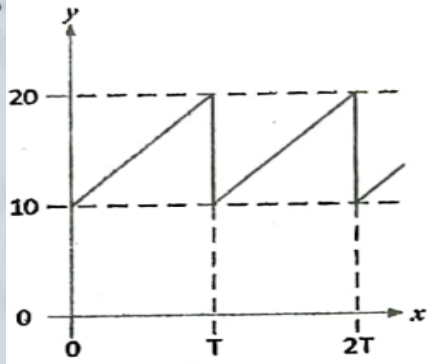
Describe two wattmeter method for three phase power measurement with proper circuit and phasor diagram. 10

Define r.m.s value of alternating current. Derive the relation between the r.m.s and peak value of a sinusoidal waveform. 8

Determine the r.m.s. and average value of the waveform shown in Fig. 5 where x-axis is in time and y axis is in volts. 6

Calculate Form factor and Peak factor for the periodic waveform as shown in Fig. 1.





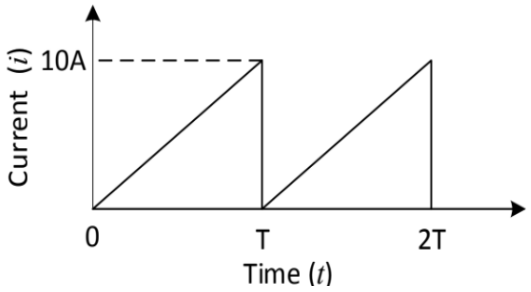


Fig. 5.

A voltage $v(t) = 141.4 \sin(314t + 10°)$ is applied to a circuit and the steady current is given by $i(t) = 14.14 \sin(314t - 20°)$ is found to flow through it.
Find (i) the power factor of the circuit and (ii) the power delivered to the circuit. Draw the phasor diagram of voltage and current. Take horizontal line as the reference. 6

A balanced star connected load of (8+j6) ohms per phase is connected to a balanced 3-phase, 400V supply. Find (i) phase current (ii) line current, (iii) active power, (iv) power factor and (v) apparent power. 5

Discuss the operating principle of a three phase induction motor . 5

What is electric power supply system? Draw a single line diagram of a typical a.c. power supply scheme. 3 + 7

Draw the impedance triangle of the AC circuit having lagging power factor and show how the power triangle can be derived from it. Mention the power factor of AC circuit. 8

An a.c. series circuit consisting of a pure resistance of 25 Ω, inductance of 0.15 H and capacitance of 80μF is supplied from a 230 V, 50Hz a.c. Find (i) the impedance of the circuit, (ii) the current, (iii) the power drawn by the circuit and (iv) the power factor. 8

A balanced load of (8+j6)Ω per phase is connected to a three-phase, 230V supply. Find the line current, power-factor, active power, reactive power and apparent power when the load is (i) star connected and (ii) delta connected. 8

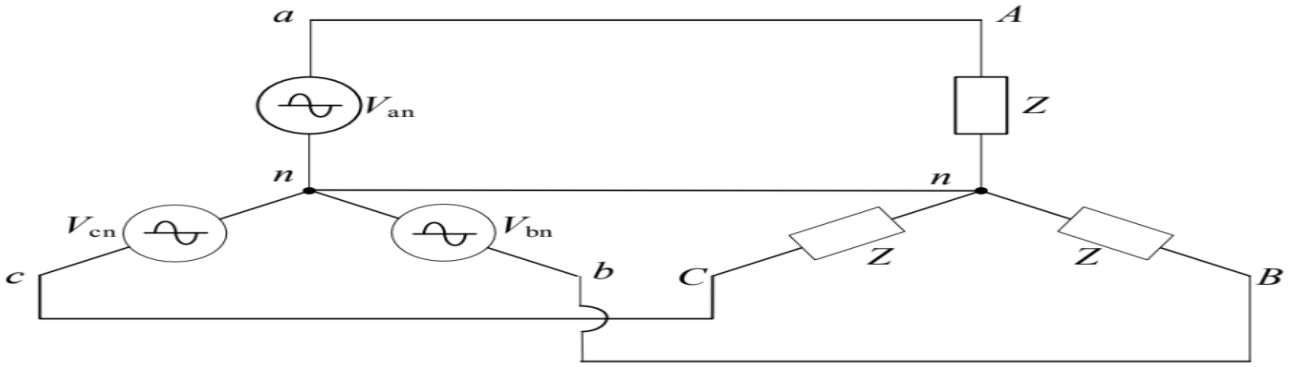
Discuss the salient features at resonance condition for parallel R-L-C circuit. Derive the {CO3} condition for resonance of the circuit with the help of suitable phasor diagram.

What is the basic difference between three phase and three isolated single phase. 3

Explain the term apparent power, active power, reactive power and power factor power in an AC circuit. {CO3} 4

Obtain current and power through the purely resistive circuit, if the voltage across the circuit is $v = V_m \sin \omega t$.

For the balanced Y-Y connected 3-phase system in Fig. 4, the line-line voltage is $208V_{rms}$ and the total power absorbed by the load is 432W at a power factor of 0.6 leading. What is the approximate value of the impedance Z? {CO4} 10



Three branches, possessing resistance of 50Ω, an inductance of 0.15H and a capacitance of 100μF respectively, are connected in parallel across a 100V, 50Hz supply. Calculate: (i) the current in each branch, (ii) the supply current and (iii) the phase angle between the supply current and the supply voltage. {CO3} 4

What are the advantages of 3-phase bulk power transmission over single phase? What is the difference between the Transmission line and distribution line?Explain a typical bulk power transfer scheme from generation to distribution with suitable schematic diagram indicating all the components. {CO3} (10)

or

Why is alternating current used for bulk power transmission? Derive the relation between line and phase voltage in star and delta connected 3-phase transmission system. {CO3} 10

4. a) Describe the two wattmeter method for power measurement for balanced 3 phase circuits. {CO3} 10

or

b) What is a Bus bar? Why is the voltage stepped up before transmission?Describe with relevant sketches the possible schemes for 3-phase, 3-wire and 4-wire power transfer in power system.{CO3} 10

Define 'slip' of a three-phase induction motor. Write down the equation for speed of an induction motor in terms of its slip, supply frequency etc. A 3-phase 6 pole 50 Hz induction motor has a slip of 1 % at no load and 3 % at full load. Calculate i)Synchronous speed (ii) no load speed (iii) full load speed iv) frequency of rotor current at standstill (v) frequency rotor current at full load. {CO2, CO4} 10

TRANSFORMER

Derive the expression of e.m.f induced in a single phase transformer. 6

Draw the approximate equivalent circuit of a transformer under load as referred to secondary side. Deduce the transformed values of winding resistance and leakage reactance. 8

A 100 kVA single phase transformer has 400 turns on the primary and 80 turns on the secondary. The primary and secondary resistances are 0.3 ohm and 0.01 ohm, respectively, and the corresponding leakage reactances are 1.1 ohms and 0.035 ohm, respectively. Calculate (i) equivalent resistance referred to the primary side (ii) equivalent leakage reactance referred to the primary side and (iii) equivalent impedance referred to the primary side. 6

A 20 kVA ideal transformer has 400 turns on the primary and 40 turns on the secondary winding. The primary side of the transformer is connected to 2kV, 50Hz supply. Find the primary and secondary currents, secondary voltage and the maximum flux in the core. {CO2} 6

3.a) Describe the equivalent circuit of a single phase transformer. 8

b)Derive the expression of emf in a single phase transformer. 4

c) Draw the phasor diagram of single phase transformer for lagging power factor load with proper explanation. 4

In a transformer, the hysteresis loss is 250 W when the maximum flux density is 0.8Wb/m^2 and the frequency 50 Hz. What would be the hysteresis loss if the maximum fluxdensity is increased to 1.1 Wb/m^2 and the frequency reduced to 40 Hz. Assume the hysteresis loss over this range to be proportional to$B_{max}^{1.2}$. 3

A 50kVA, 4400/220V transformer has the parameters of r_1=3.45 Ω, r_2=0.009 Ω, x_1=5.2 Ω, x_2=0.015 Ω, X_m=1250 Ω and R_c=600 Ω. Calculate for the transformer equivalent resistance and reactance (a) referred to the primary (b) referred to the secondary. Based on the results, draw the equivalent circuit of the transformer referred to the secondary side clearly indicating the values of the resistances and reactances. Here, refer 4400V side as the primary.