

P3-upq-Feb.-13KL-108 A4 E

Con. 6889-13.

(REVISED COURSE)

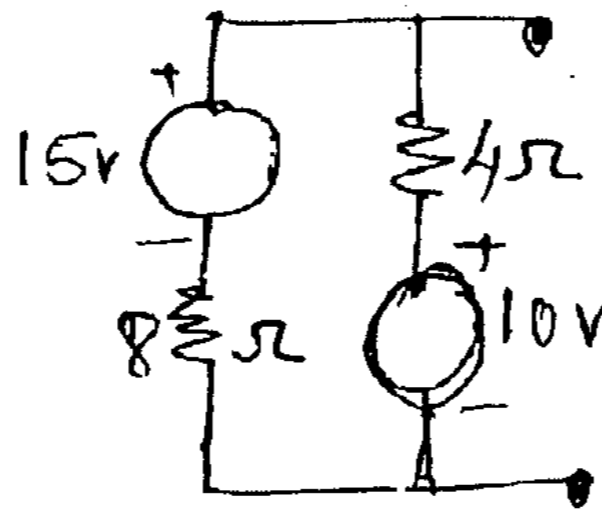
GS-5139

(3 Hours)

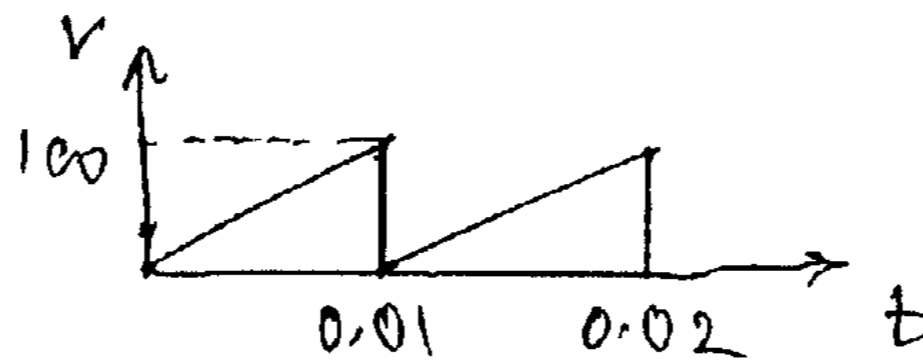
[Total Marks : 80

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **three** questions out of **remaining**.
 (3) Assume **suitable** data if **necessary**.

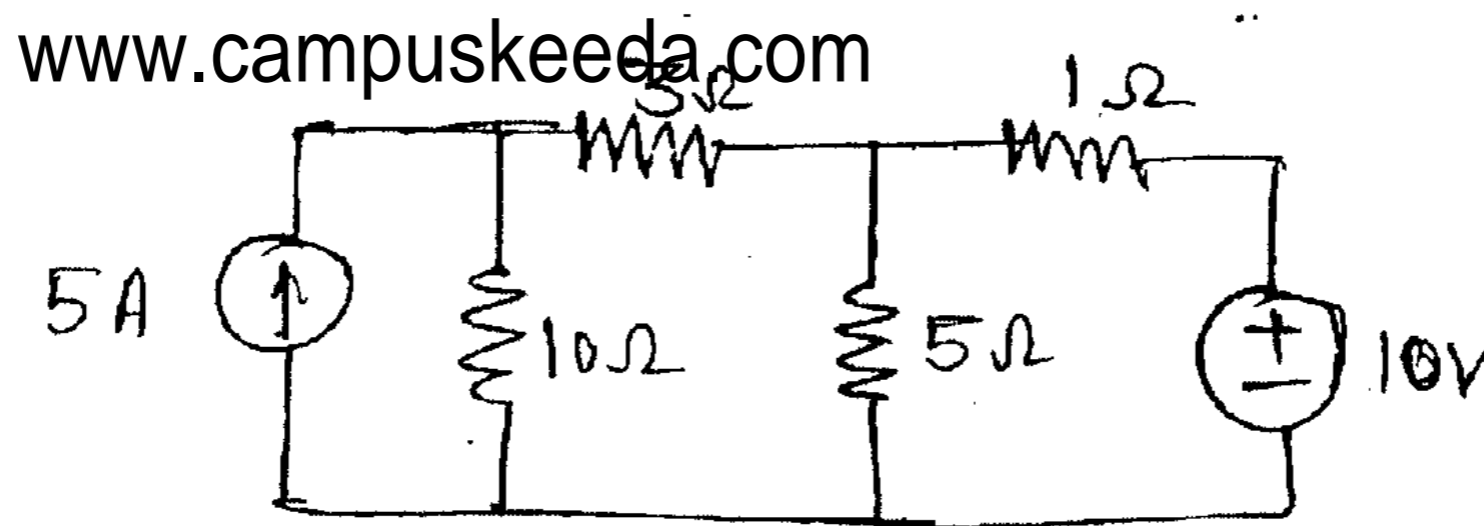
1. (a) Using source transformation convert the circuit given below to a single voltage source in series with a resistor. 3



- (b) Derive the condition for maximum power transfer through the network. 3
 (c) Determine the rms value of voltage waveform shown below :— 3

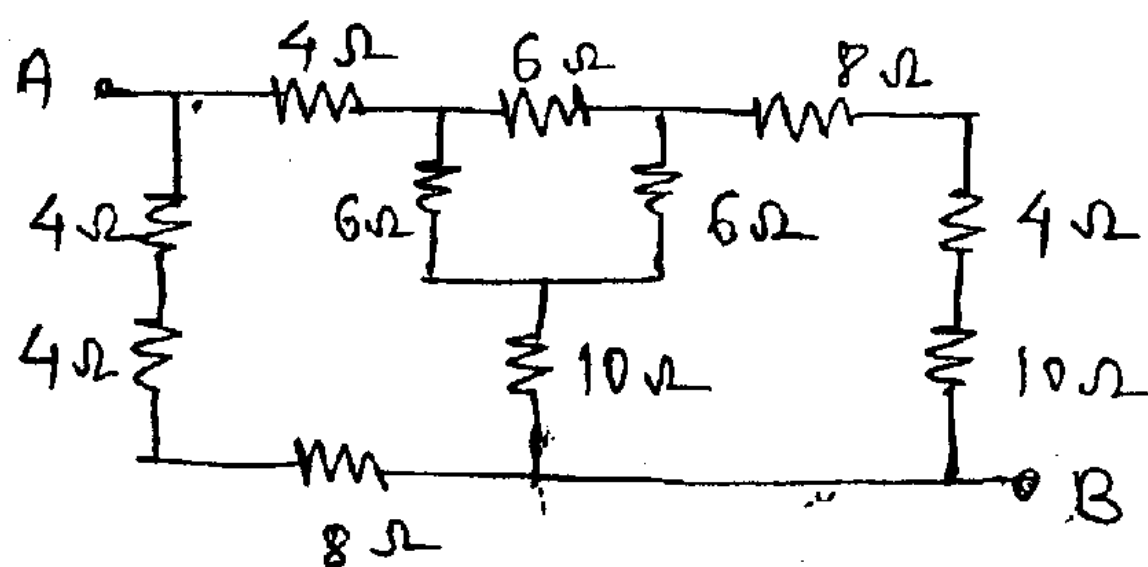


- (d) Give the comparison between series and parallel resonance circuits. 3
 (e) Draw the phasor diagram of 3-phase star connected load with lagging power factor. 2
 (f) State the working principle of Transformer and derive expression for emf induced. 4
 (g) Define Ripple factor and Voltage Regulation for rectifier circuits. 2
2. (a) For the network given below find current through 3Ω resistor using nodal analysis. 6



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- (b) Two coils A and B are connected in series across 240V, 50Hz supply. The resistance of A is 5Ω and inductance of B is 0.015H. If the input from supply is 3kW and 2 kVAR. Find inductance of A and resistance of B. Calculate voltage across each coil. 8
- (c) A 3000/200-V, 50 Hz, single phase transformer has a cross-sectional area of 150 cm^2 for the core. If number of turns on the low voltage winding is 80, determine number of turns on the high voltage winding and maximum value of flux density in the core. 6
3. (a) Each phase of a delta connected load consist of a 50 mH inductor in series with a parallel combination of 5Ω resistor and a $5\mu\text{F}$ capacitor. The load is connected to a three phase, 550V, 50Hz ac supply. Find (i) Phase current, (ii) Line current (iii) Power drawn (iv) power factor, (v) Reactive power and kVA rating of the load. 8
- (b) A 5 kVA, 1000/200V, 50 Hz, single phase transformer gives following test results— 6
- | | | | |
|-------------------|------|-------|-------|
| OC test (LV side) | 200V | 1.2 A | 90 W |
| SC test (HV side) | 50V | 5 A | 110 W |
- Determine efficiency as half load at 0.8 p.f. lagging.
- (c) What is the function of filter in rectifier circuits. Explain with appropriate waveforms. 2
- (d) Draw and explain output characteristics of transistor in CE configuration. 4
4. (a) For the circuit shown below find the resistance between terminals A and B. 7



- (b) The voltage drops across four series connected impedances are given :— 5

$$V_1 = 60 \sin\left(wt + \frac{\pi}{6}\right), V_2 = 75 \sin\left(wt - \frac{5\pi}{6}\right)$$

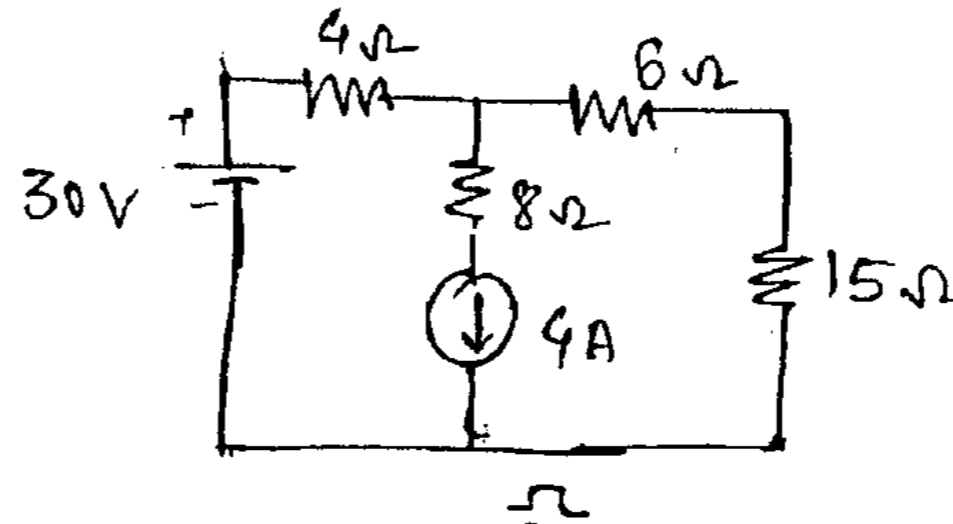
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$$V_3 = 100 \cos\left(wt + \frac{\pi}{4}\right), V_4 = V_{4m} \sin(wt + \phi_4)$$

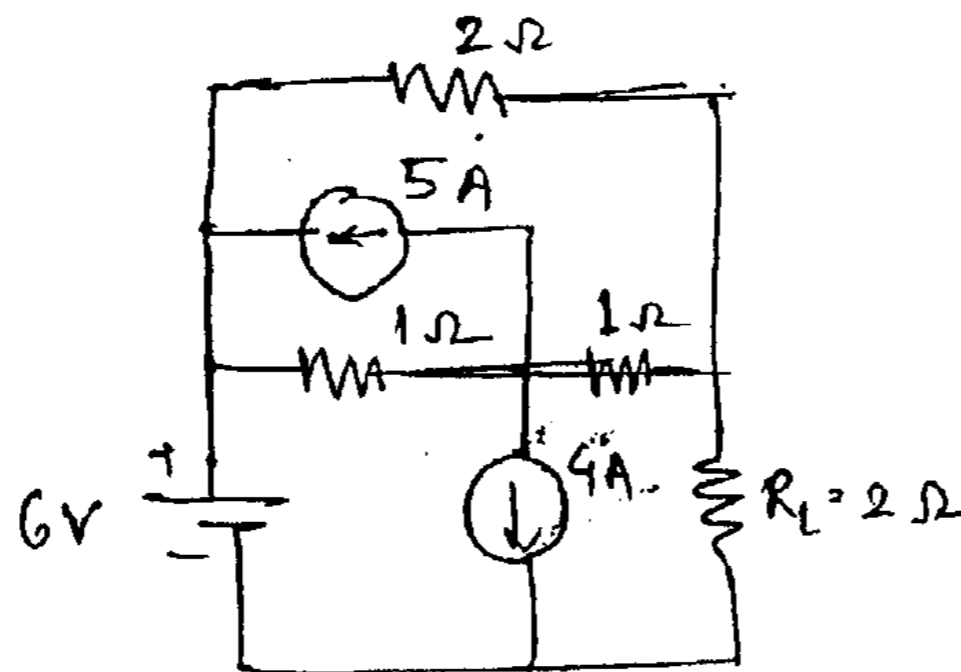
Calculate the values of V_{4m} and ϕ_4 if the voltage applied across series circuit is

$$140 \sin\left(wt + \frac{3\pi}{5}\right)$$

- (c) Draw the circuit for measurement of 3-phase power using two wattmeters and state its advantages over other methods of 3-phase power measurement. 4
- (d) Draw and explain Half wave rectifier with appropriate waveforms. 4
- 5. (a) Using Norton's theorem, calculate the current flowing through 15Ω load resistor in the given circuit. 8



- (b) A 46 mH inductive coil has a resistance of 10Ω . (i) How much current will it draw if connected across a 100V , 60Hz supply? (ii) What is the power factor of the coil? (iii) Determine the value of capacitance that must be connected across the coil to make the power factor of overall circuit unity. 4
- (c) A 30kVA , $2400/120\text{V}$, 50Hz transformer has a high voltage winding resistance of 0.1Ω and a leakage reactance of 0.22Ω . The low voltage winding resistance is 0.035Ω and the leakage reactance is 0.042Ω . Calculate the equivalent winding resistance, reactance and impedance referred to (i) high voltage side (ii) low voltage side and (iii) total copper loss of the transformer. 8
- 6. (a) Determine current through $R_L = 2\Omega$ in the circuit shown below using superposition theorem. 7



- (b) An inductor having a resistance of 25Ω and Q_0 of 10 at a resonant frequency of 10kHz is fed from $100\angle 0^\circ$ supply. Calculate (i) Value of series capacitance required to produce resonance with the coil. (ii) The inductance of the coil (iii) Q_0 using $\frac{L}{C}$ Ratio (iv) Voltage across capacitor (v) Voltage across coil. 7
- (c) The input power of 3-phase motor was measured by two wattmeter method. The reading of two wattmeters are 5.2kW and -1.7kW and the line voltage is 415V . Calculate the total Active power, Power factor and Line current. 6
