

College of Engineering, Pune
FY BTech
 (EE 101)- (Basic Electrical Circuits)

Date- 20.04.2009
 Academic Year: 2008- 09

Timing: 3 hrs
 Max. Marks: 50

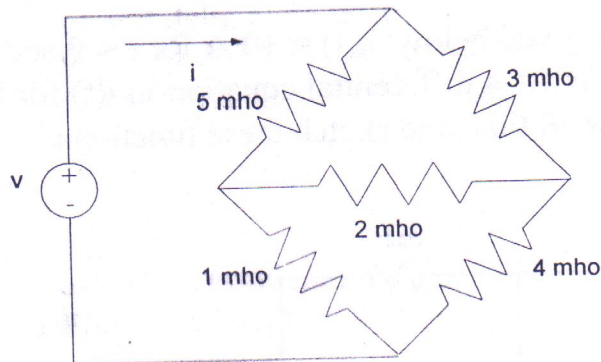
Spring Semester

Instructions:

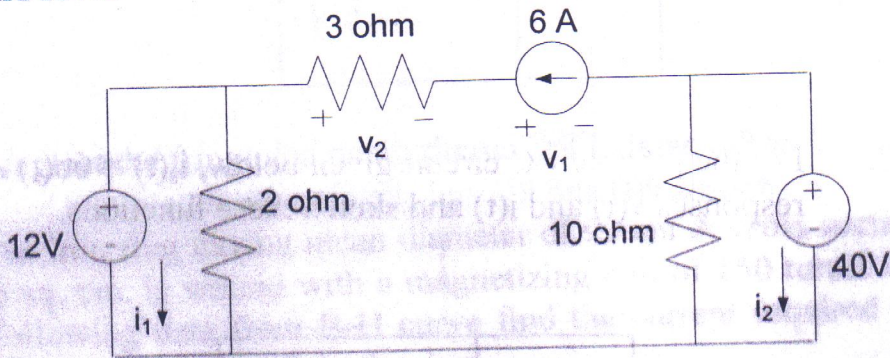
1. All Questions are compulsory.
2. Figure to right indicate full marks.
3. Draw neat figures wherever required.
4. Make necessary assumptions and assume suitable data wherever required.

Marks
 4

Q. 1 A. Find $G = i/v$ by mesh analysis



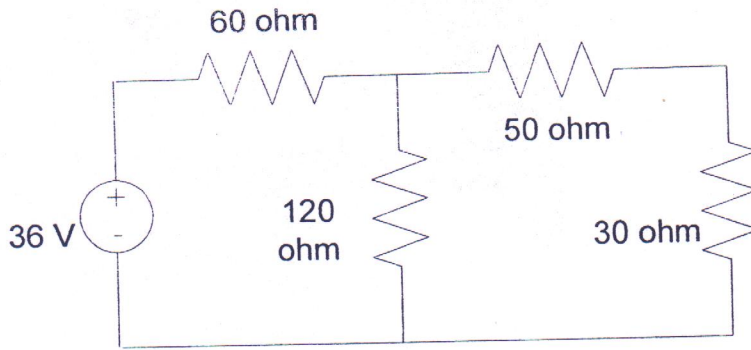
B Find the variables indicated for the circuits shown below using KCL and KVL 3



OR

B. Determine the current through and voltage across the 30 ohm resistor shown in the figure below by applying 3

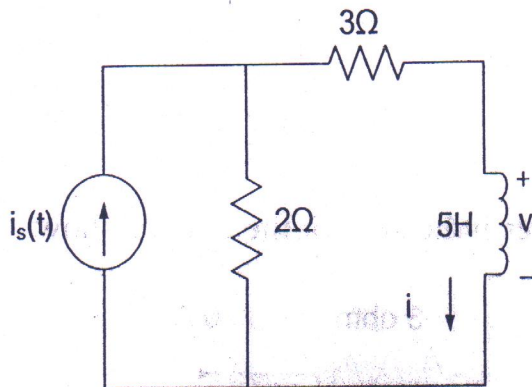
- a) Thevenin's theorem
- b) Norton's theorem



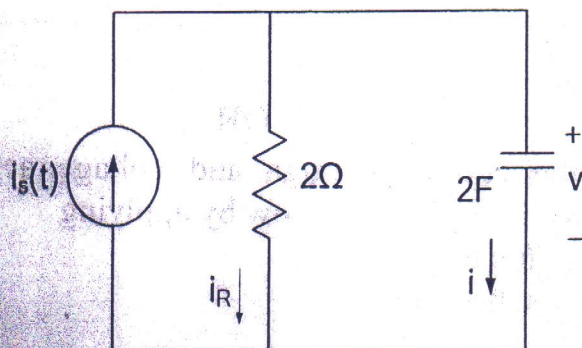
C. Find the current flowing at the instant of switching 60 W lamp on a 240 V dc supply. Given that filament temperature is 2000 °C and resistance temperature coefficient at 0°C is 0.005/°C. Assume temperature of switching is 0°C. 3

Q. 2 A. Give symbolic representation of dependent and independent voltage and current sources. 2

B. For the circuit given below, $i_s(t) = 10$ A for $t < 0$ sec and $i_s(t) = 0$ A for $t \geq 0$ sec. Write a differential equation in $i(t)$ for $t \geq 0$ sec. Find $i(t)$ and $v(t)$ for all time and sketch these functions. 4



C. For the parallel RC circuit given below, $i_s(t) = 6u(t)$ A. Find the step responses $v(t)$ and $i(t)$ and sketch these functions. 4



- Q. 3 A. A circuit has a resistor of 10Ω connected in series with a capacitor of $100 \mu\text{F}$. If a variable frequency supply of 100 V is connected across the circuit, calculate the voltage drop across the resistor and capacitor for supply frequency of (i) 50 Hz and (ii) 100 Hz . Calculate the circuit power factors for both the conditions. What will be the new values of the power factors if a pure inductance of 50 mH is connected in series with the circuit to form R-L-C circuit? 5

OR

- A. Three identical coils, each having resistance of 15Ω and inductance of 0.03 H , are connected in delta across a three phase, 400 V , 50 Hz . Supply. Draw neat diagram and calculate 5
- (i) The phase current,
 - (ii) The line current, and
 - (iii) The power consumed.
- B. For star and delta connected loads, derive the numerical relationship between 5
- (i) Line current and phase current
 - (ii) Line voltage and phase voltage
 - (iii) Power in terms of line voltage, line current and power factor.

- Q. 4 A 1) Define & formulate following terms:- 4
- a) Flux
 - b) MMF
 - c) Reluctance
 - d) Permeability.

2) Write short note on "Auto-transformer".

- B. A circular iron ring 30 cm in diameter has an air gap 2 mm wide cut in it. The cross sectional area of iron ring is 4.5 sq. cm . Estimate the current flowing through the coil of 200 turns to produce the 0.7 mWb flux in the air gap. Relative permeability of iron is 650 . Neglect the fringing & leakage flux. 3
- C. An iron ring having mean diameter of 90 cm & cross sectional area 5 sq. cm . is wound with a magnetizing coil of 150 turns. Using the following data from B-H curve find the current required to set up the flux of 0.5 mWb in the ring. 3

| | | | | | |
|---------------------|-----|-----|-----|-----|-----|
| Flux density (T) | 0.9 | 1.1 | 1.2 | 1.3 | 1.5 |
| A/m | 260 | 450 | 600 | 820 | 940 |

OR

C

Coils A and B having 100 and 150 turns respectively, are wound side by side on a closed magnetic circuit on 125 cm^2 and mean length 2 m. Determine : (a) the self inductance of each coil; (b) the mutual inductance between the coils ; (c) the voltage induced in the second coil if the current changes from 0 A to 5 A in the first coil in 0.02 sec. The relative permeability of the magnetic circuit is 2000.

- Q. 5 A. Explain construction of DC machine with aid of neat diagram showing main parts. 4
- B. Derive EMF equation of the DC machine 3

OR

- B. Explain the principle of operation of Induction Motor 3
- C. A 1 kVA single phase transformer has an iron loss of 12 Watts and full load copper loss of 18W. Find the full load efficiency assuming the power factor to be 0.9 lag. 3
