

**II B.Tech I Semester Supplementary Examinations, May 2005**  
**ELECTRICAL CIRCUITS-I**  
**(Electrical & Electronic Engineering)**

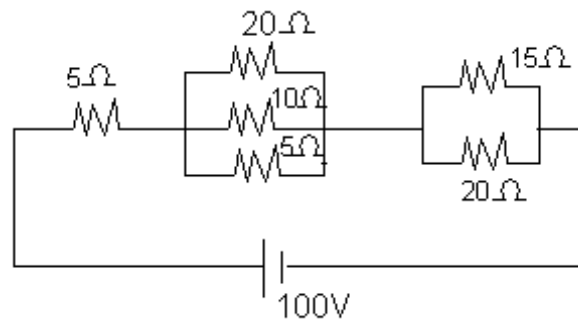
Time: 3 hours

Max Marks: 70

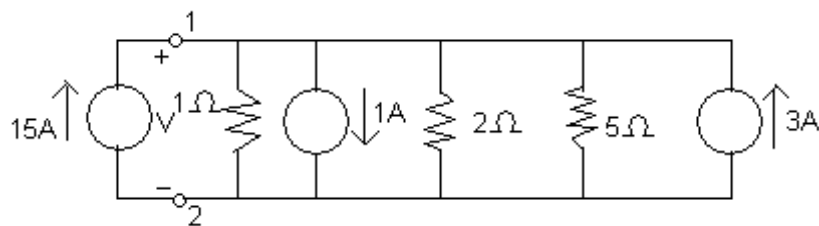
**Answer any FIVE Questions**  
**All Questions carry equal marks**

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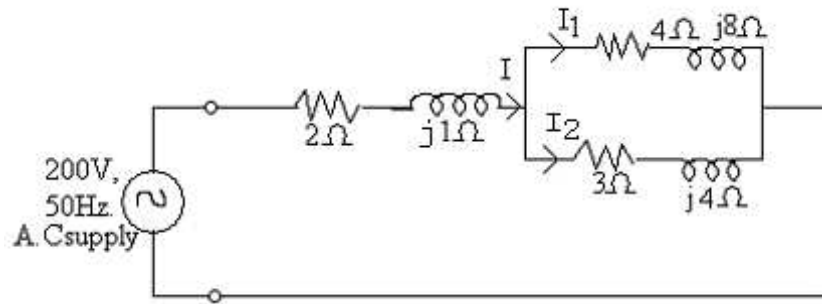
1. (a) State and explain kirchoff's law.
- (b) For the circuit shown below, calculate the total current, individual currents in each branch . Also, calculate the total power consumed.



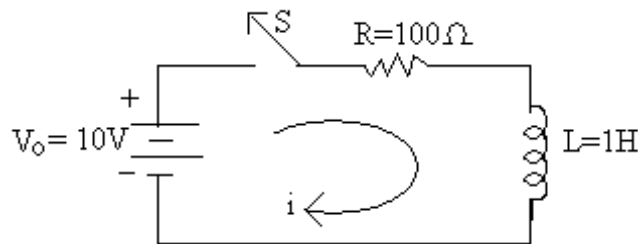
- (c) Explain the dot connection used in magnetically coupled circuits.
2. (a) Reduce the following network into a single current source and single resistor network at the terminals 1 and 2. Also, find the voltage across them.



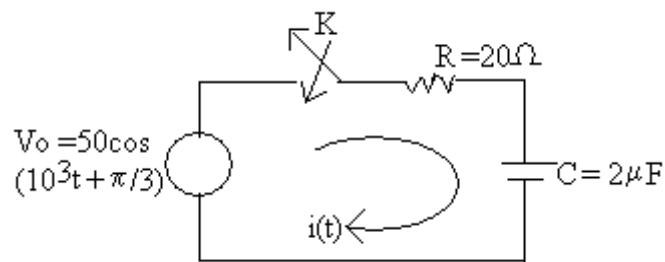
- (b) Define the following:
  - i. R.M.S. value
  - ii. Average value and
  - iii. Form factor of a sinusoidal quantity.
- (c) Two inductors have self inductance of 0.1mH and 0.4 mH and a mutual inductance of 0.15mH. What is the value of the coefficient of coupling between them?
3. (a) In a series RLC circuit, an A.C. voltage of  $120 \angle 0^\circ$  V is applied at a frequency of 400 rad/sec. The input current leads the voltage by  $63.5^\circ$ . Find the value of R if  $L=25$  mH and  $C=50\mu F$ . What are the drops across L and C?



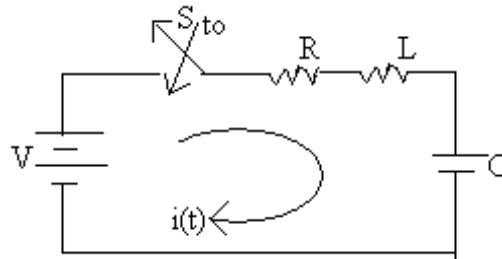
- (b) In the network shown in figure, find  $I_1, I_2$ , and  $I$  when a 200 V A C, 50Hz voltage is applied at the input.
4. (a) Define the time constant of R-L circuit. Give its significance.
- (b) In the circuit shown in figure, switch  $V_o$  S is closed at  $t=0$ . Find the value of  $i$ ,  $\frac{di}{dt}$  and  $\frac{d^2i}{dt^2}$  at  $t=0^+$ .



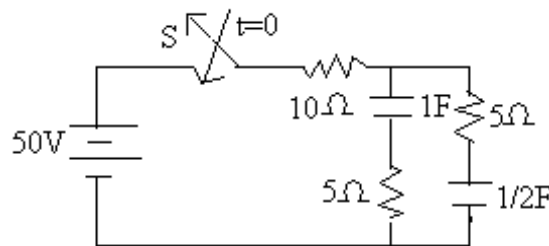
5. In the circuit shown below in figure, determine the complete solution for the current when switch K is closed at  $t=0$ . Applied voltage is  $v(t)=50 \cos(10^3t+\pi/3)$ .



6. (a) For the network shown in figure, determine the expression for  $i(t)$ . The switch is closed at  $t=0$ . Take  $V=1V$ ;  $R=2\Omega$ ;  $L=1H$  and  $C=0.5F$ .



- (b) Derive the expression for  $i(t)$  when R-L series circuit is excited by sinusoidal voltage of  $v(t) = V_m \sin(\omega t + \theta)$ .
7. (a) State and explain initial and final value theorems.
- (b) In the network shown in figure, the switch is closed at  $t=0$  and there is no initial charge on either of the capacitors. Find the current 'i' by Laplace transform method.



8. (a) Define:
- Quality factor
  - Selectivity of a series resonant circuit.
- (b) A  $5 \mu F$  capacitor is connected in series with a coil having inductance of 50 mH. Determine the frequency of resonance, the resistance of the coil if a 50V source operating at resonant frequency causes a circuit current of 10mA. What is the quality factor of the coil?
- (c) Derive the resonant frequency of a R-L-C parallel circuit when it is connected across a A.C. supply.

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