2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS
ELECTRICAL CIRCUITS-I
(ELECTRICAL & ELECTRONIC ENGINEERING)

MAY 2005

TIME 3 HOURS
MARKS: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) State and explain kircho®'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, ¯nd the voltage across them.

(b) De¯ne 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 coe±cient of coupling between them?

3. (a) In a series RLC circuit, an A.C. voltage of 120 j0o V is applied at a frequency of 400 rad/sec. The input current leads the voltage by 63.50. Find the value of R if L=25 mH and c=50¹F. What are the drops across L and C?

(b) In the network shown in ¯gure, ¯nd I1,I2, and I when a 200 V A C, 50Hz voltage is applied at the input.

4. (a) De¯ne the time constant of R-L circuit. Give its signi¯cance.

(b) In the circuit shown in ¯gure, switch Vo S is closed at t=o. Find the value of of i, di dt and d2i dt2 at t=o+.

5. In the circuit shown below in ¯gure, determine the complete solution for the current when switch K is closed at t=o. Applied voltage is v(t)=50 cos(103t+¼/3).

6. (a) For the network shown in ¯gure, determine the expression for i(t). The switch is closed at t=0. Take V=1V; R=2; 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) = Vmsin (cot+µ).

7. (a) State and explain initial and ¯nal value theorems.

(b) In the network shown in ¯gure, the switch is closed at t=o and there is no initial charge an either of the capacitors. Find the current `i' by Laplace transform method.

8. (a) De¯ne:

i. Quality factor

ii. Selectivity of a series resonant circuit.

(b) A 5 ¹F 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.