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B.E / B.Tech. (Full Time) DEGREE END SEMSESTER EXAMINATIONS, NOV / DEC 2011

ELECTRICAL AND ELECTRONICS ENGINEERING BRANCH

SECOND SEMESTER

EE 9151 ELECTRIC CIRCUIT ANALYSIS

(REGULATIONS 2008)

Time: 3 Hours Max. Marks: 100

Answer ALL Questions

PART -A (10 x 2 = 20)

1. A battery has an internal resistance of 0.5 ohm and open circuit voltage of 12 V. What is the power lost within the battery and the terminal voltage on full load if a resistance of 3 ohms is connected across the terminals of the battery?
2. Define the term RMS value and Average value.
3. Draw the current –time profile for discharging condition of R-L circuit.
4. Define initial value and final value theorem.
5. A 50 Hz sinusoidal voltage v=311 sinωt is applied to a RL series circuit. If the magnitude of resistance is 5Ω and that of inductance is 0.02 H. Calculate the RMS value of steady state current and relative phase angle.
6. Draw the variation of circuit parameters with frequency in a series resonance circuit.
7. Write the steps involved for constructing the nodal admittance matrix.
8. Define compensation theorem.
9. Find the expression for the mutual inductance in the series connection of two coupled coils, when the flux of the two coils assist each other, the net equivalent inductance being L_1 and when the flux of the two coils oppose each other, the equivalent inductance being L_2.
10. A Delta connected circuit has 6+j8 of load in each arm is connected across a balanced 100 V, 50 Hz supply. Find the line currents in the system.

PART -B (5 x 16 = 80)

11. (a) (i) A non- alternating periodic waveform has been shown in Figure 1. Find the Average value, RMS value and form factor for the waveform. (8)

(ii) Obtain the equivalent inductance at terminal "1-2" for the circuit shown in figure 2. (8)

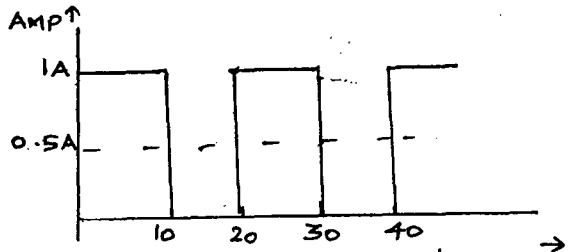

FIGURE 1

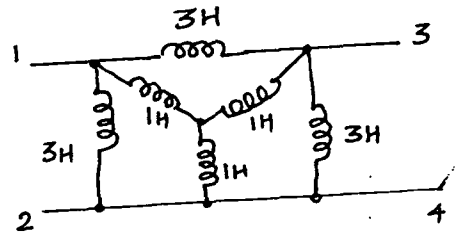

FIGURE 2

12. (a) What do you meant by natural and forced responses? Explain the concept of RLC transients with step input DC voltage.

(OR)

(b) (i) The 10 μF capacitor in RC circuit of Figure 3 has initial charge of 100 μC with polarities as shown in the figure. At t=0, the switch being closed, a DC voltage of 100 V is applied. Find the expression for the current.

(ii) Find the pole –zero locations of the current transfer ratio I_2 / I_1 in s-domain for the circuit shown in figure 4.

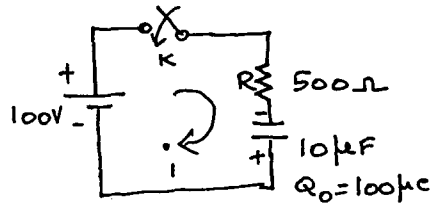

FIGURE 3

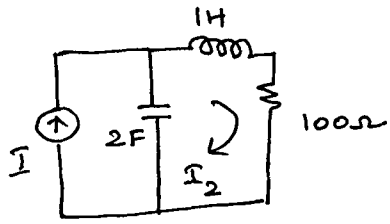

FIGURE 4

13. (a) (i) A series RLC circuit has R = 10Ω, L= 1 H, C= 20μ F. A 100 V, 50 Hz supply is applied across the circuit. Find the input current and voltage across the elements. (8)

(ii) Write short notes on:

(i) Power factor (ii) Apparent Power (iii) Reactive Power (iv) Power Triangle (8)

(OR)

(b) Explain the parallel resonance of RLC circuits with neat diagram and also draw the voltage and current variation with frequency.

14. (a) (i) Write the steps involved for constructing the mesh impedance matrix for solving matrix equation. (8)

(ii) Find the current through the resistor r_2 by nodal method for the figure 5. (8)

(OR)

(b) Explain the maximum transfer theorem and write down the limitations of the theorem. What should be the value of R_L , so the maximum power can be transferred from the source to R_L in the figure 6.

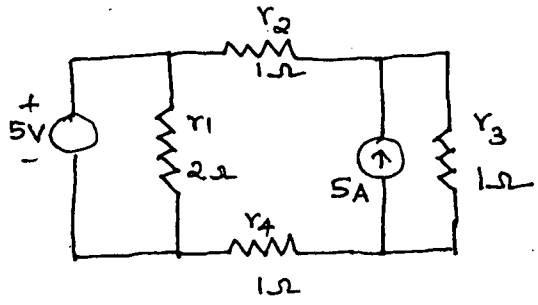

FIGURE 5

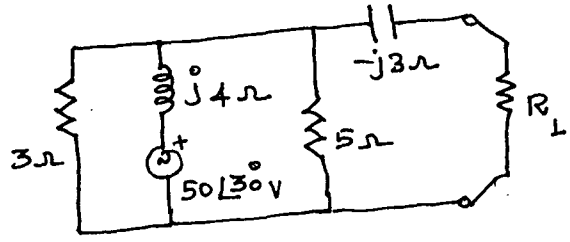

FIGURE 6

15. (a) (i) Explain the single tuned coupled circuits. (8)

(ii) Find V_2 in the circuit of figure 7, such that the current in the left hand loop (loop-1) is zero. Assume V1= 5∠0°V.

(OR)

(b) (i) Derive the relationship between the line and phase voltages and currents in a Delta connection. (8)

(ii) A three phase balanced system supplies 110 V to a delta connected load whose phase impedances are equal to (3.54 +j 3.54) ohm. Determine the line currents and draw the phasor diagram. (8)

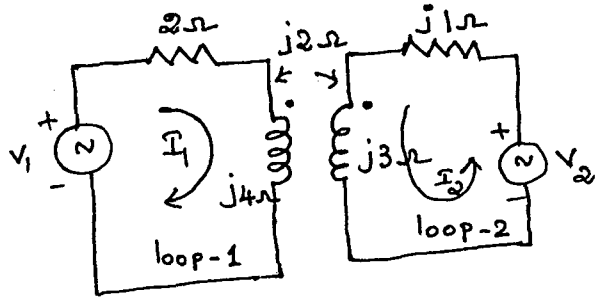

FIGURE 7