R 263

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2005.

Second Semester

Electronics and Communication Engineering

EC 1151 — CIRCUIT ANALYSIS

(Common to First Semester Part-time B.E. – Regulations 2005)

(Regulations 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

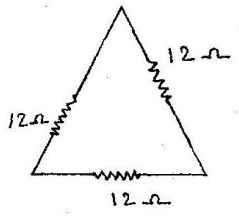
PART A — ($10 \times 2 = 20$ marks)

1. The element of a 500 watt electric iron is designed for use on a 200 volts supply. What value of resistance is needed to be connected in series in order that the iron can be operated from 240 volts supply?

2. Two resistors 4 ohms and 6 ohms are connected in parallel. If the total current is 12 A, find the current through each resistor.

3. State Maximum power transfer theorem.

4. Find the star equivalent of the delta network shown below.



5. Define RMS value of a sinusoidal current.

6. An emf 326 sin 314 t is applied to a resistive - inductive circuit and the current is $\sin(314\ t - 1.3736)$. Find the resistance of the circuit.

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7. Sketch the source free response of a dc RC circuit.

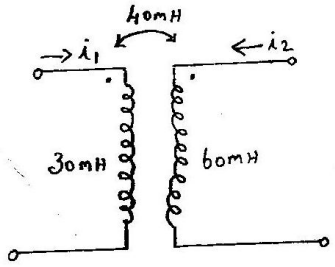
8. How are the applied voltage and resulting current of a series resonant circuit related in the phasor diagram?

9. Find the maximum value of mutual inductance of two inductively coupled coils with $L_1 = 100$ mH and $L_2 = 25$ mH.

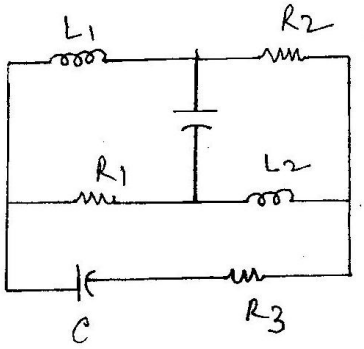
10. What is a Co-tree?

PART B — ($5 \times 16 = 80$ marks)

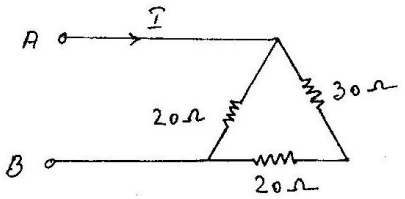
11. (i) Obtain the T equivalent of the linear transformer shown in the figure below. (8)



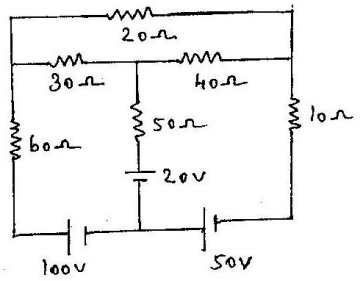
(ii) Draw the graph of the network shown in the figure below and construct four possible tress for the graph. (8)



12. (a) (i) A battery connected across AB in the circuit shown in the figure below is delivering 28 watts into the network of resistors. Calculate the voltage across AB, if the emf of the battery is 22 volts. Also find the internal resistance of the battery. (8)



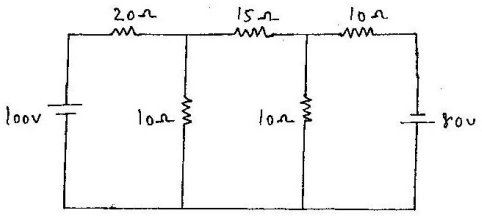
(ii) Calculate the current in the 50 ohms resistor in the network shown in the figure below using Mesh analysis. (8)



Or

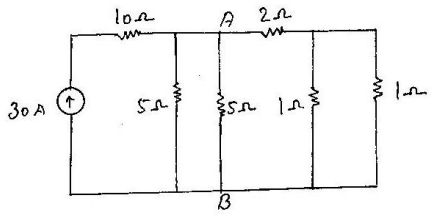
(b) (i) Two coils connected in series have a resistance of 18 ohms and when connected in parallel have a resistance of 4 ohms. Find the value of resistance of the two coils. (6)

(ii) Calculate the voltage across the 15 ohms resistor in the network shown in figure below using Nodal analysis. (10)



13. (a) (i) State and explain Thevenin's theorem. (7)

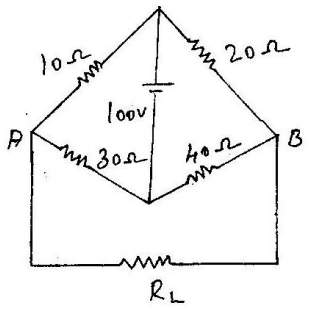
(ii) Find the current through *AB* in the network shown in the figure below using Norton's theorem. (9)



Or

(b) (i) State and explain the Principle of Superposition. (6)

(ii) Determine the value of load resistance that will receive maximum power from the source, in the network shown in the figure below. Also find the maximum power delivered to the load. (10)



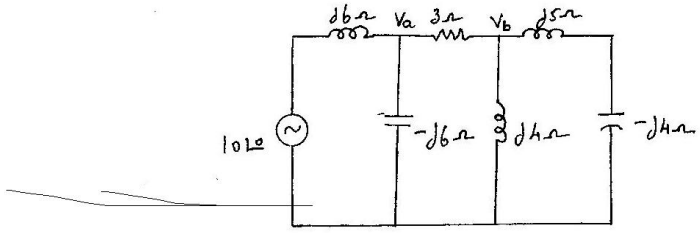
14. (a) (i) A 318 microfarad capacitor is connected across a 230 V, 50 Hz system. Determine

(1) the capacitive reactance,

(2) rms value of current, and

(3) equations for voltage and current. (6)

(ii) Determine V_a and V_b in the circuit shown in the figure below. (10)

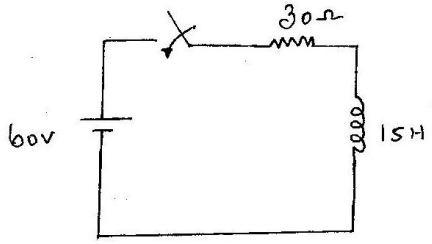


Or

(b) (i) A pure inductance of 318 mH is connected in series with a pure resistance of 75 ohms. The circuit is supplied from a 50 Hz source and the voltage across the 75 ohms resistor is found to be 150 volts. Calculate the supply voltage and the phase angle. (9)

(ii) A Coil having a resistance of 7 ohms and an inductance of 31.8 mH is connected to 230 volts, 50 Hz supply. Calculate the circuit current, phase angle, power factor and power consumed. (7)

15. (a) (i) Determine the expression for current in the circuit shown in the figure below when the switch is closed at time t = 0. (8)

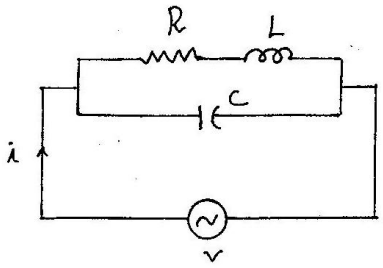


(ii) A coil having L = 2.4 H and R = 4 ohms is connected to a constant supply source of 100 V. How long does it take for the voltage across the resistance to reach 50 volts? (8)

Or

(b) (i) A series RLC circuit with R = 10 ohms, L = 0.1 Henry and C = 50 micro farad has an applied voltage of $50\angle^{\circ}$ at variable frequency. Find the resonant frequency and the frequency at which maximum voltage occurs across the inductor and capacitor. (8)

(ii) Obtain an expression for the resonant frequency for the circuit shown in the figure below. (8)



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