Reg. No. : | | | | | | | | | |

Question Paper Code: 21010

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2015.

Second Semester

Electrical and Electronics Engineering

01UEE207- ELECTRIC CIRCUITS

(Regulation 2013)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. A 230V, 100W lamp is connected to 200V supply. What will be the power dissipated by the lamp?

2. A fluorescent tube choke is connected across 230V, 50Hz AC supply. If the resistance and reactance of the choke are 100Ω, 1H respectively, determine the current through the choke.

3. A 12 V DC source has internal resistance of 1Ω. The maximum power that can be delivered by the source is _____.

4. What is the condition for maximum power transfer in DC and AC circuits?

5. Determine the resonance frequency of a RLC series circuit with R= 5Ω, L= 0.02H and C= 5μF.

6. An RLC series circuit is supplied with 230V AC of variable frequency. If R=10Ω, L=10mH and C=10μF, determine the maximum current through the circuit.

7. The time constant of an RC circuit with R=1k and C= 100μF is _____.

8. Give the condition for critical damping of an RLC series circuit.

9. A star connected load has impedance of $(6 + j8)$ Ω in each phase. Determine the line current when it is connected to $400V$, 3 phase, $50 Hz$ supply.

10. In three phase power measurement using two wattmeters, what is the power factor if one wattmeter reads zero?

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Three resistors are in series and have a total constant voltage V_T. R_1 has a voltage of $20V$, R_2 has a power of $25W$ and $R_3 = 2Ω$. If the current through them is 5A, find V_T. (8)

   (ii) Write the mesh current matrix equations for the network of figure 1 by inspection and solve for the mesh currents. (8)
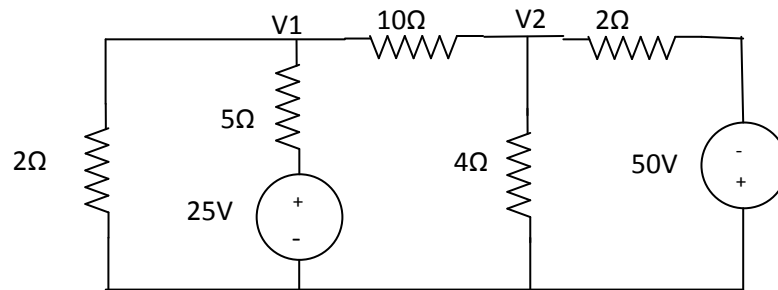

Figure 1

Or

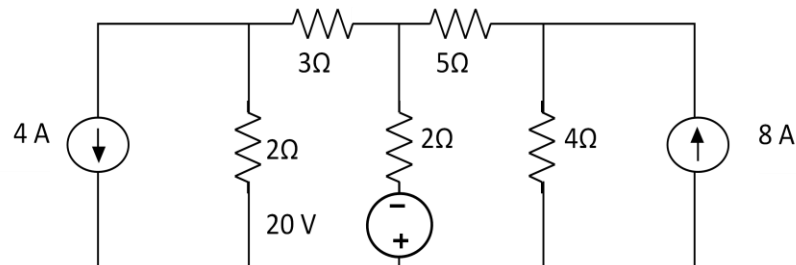(b) Using nodal analysis, calculate the current through the 5 Ω resistor in the circuit shown in figure 2. (16)

Figure 2

2

21011

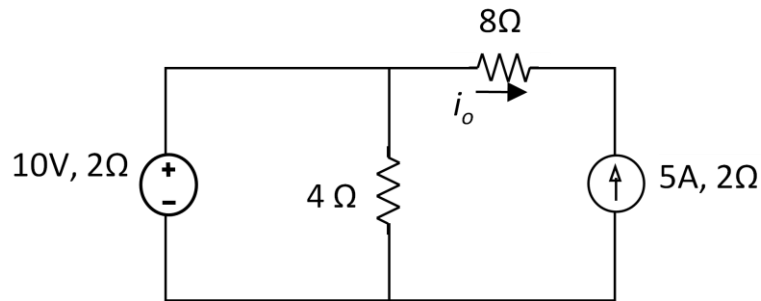12. (a) Find i_o in the network shown in figure 3 using Superposition theorem.　　　(16)

Figure 3

Or

(b) (i) Explain how three resistances connected in delta can be converted into equivalent star. Derive the relationship.　　　(8)

(ii) An AC power source 100V, 50Hz has an internal impedance of $2 + j5\ \Omega$. What will be the maximum power that can be delivered by this source to load?　　　(8)

13. (a) A series RLC circuit consists of $R = 16\ \Omega$, $L = 5$ mH and $C = 2\ \mu$F. Calculate the quality factor, bandwidth and half power frequencies.　　　(16)

Or

(b) (i) Derive the relationship between Self Inductance and Mutual Inductance.　(8)

(ii) Two coupled coils $L_1 = 0.8$H and $L_2 = 0.2$H have a co efficient of coupling $k = 0.9$. Find the mutual inductance M and turns ratio N_1 / N_2.　　　(8)

14. (a) A RL series circuit is excited by a sinusoidal source $e(t) = 10 \sin 100t$ volts, by closing the switch at $t = 0$. Take $R = 10\ \Omega$ and $L = 0.1$ H. Determine the current $i(t)$ flowing through the RL circuit.　　　(16)

Or

(b) (i) Derive the expression for transient current and voltage drop across resistance of an RL series circuit supplied by a constant voltage source at $t = 0$.　　　(8)

(ii) A series RL circuit has a constant voltage V applied at $t = 0$. At what time does voltage drop across R is equal to voltage drop across L?　　　(8)

3

21011

15. (a) A 415V, 50Hz, 3ϕ voltage is applied to three star connected identical impedances. Each impedance consists of a resistance of 15 Ω, a capacitance of 177 μF and an inductance of 0.1 H in series. Find (i) phase current (ii) line current (iii) power factor (iv) active power (v) reactive power and (vi) total VA. If the same impedance is connected in delta, find the line current and power consumed. (16)

Or

(b) Power is measured in a 3 phase, 400V (Line-Line) system by two wattmeters. If the readings are $W_1 = 3500W$ and $W_2 = 1500W$, determine the line currents, power and power factor if reading of W_2 is obtained after reversing its potential coil. (16)

_____

21011