Reg. No. :

Question Paper Code: 41232

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2016

Second Semester

Electrical and Electronics Engineering

14UEE207 - ELECTRIC CIRCUITS

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Six light bulbs are connected in parallel across 110 *V*. Each bulb is rated at 75 *W*. How much current flows through each bulb?

    (a) 0.321 *A*   (b) 0.682 *A*   (c) 7.5 *A*   (d) 110 *A*

2. A 100 Ω resistor is connected across the terminals of a 9 *V* battery. What is the power dissipation in the resistor?

    (a) 9 *W*   (b) 0.09 *W*   (c) 0.19 *W*   (d) 0.81 *W*

3. Three equal resistances of 9 Ω are connected in delta. What is the resistance in one of the arms in an equivalent star circuit?

    (a) 3 Ω   (b) 9 Ω   (c) 1 Ω   (d) 27 Ω

4. Maximum power is transferred to load, when the load resistance is

    (a) equal to half of the source resistance   (b) equal to source resistance
    (c) equal to zero   (d) equal to twice the source resistance

5. The current in a pure capacitor

    (a) lags behind the voltage by 90^0 (b) leads the voltage by 90^0
    (c) is in phase with the voltage   (d) lags behind the voltage by 45^0

6. The maximum possible mutual inductance of two inductively coupled coils with self inductances $L1 = 25\ mH$ and $L2 = 100\ mH$ is given by

   (a) $125\ mH$ (b) $75\ mH$ (c) $50\ mH$ (d) $100\ mH$

7. An inductor does not allow sudden changes

   (a) in voltages   (b) in currents
   (c) in both currents and voltages   (d) in neither of the two

8. An RL circuit has $R = 2\ \Omega$ and $L = 4\ H$. The time constant is

   (a) $4s$ (b) $0.5s$ (c) $8s$ (d) $2s$

9. In a Y-Y system, a line voltage of 220 V produces a phase voltage of

   (a) 381 V (b) 156 V (c) 127 V (d) 22 V

10. In the measurement of 3 phase power by two Wattmeter method, if the two Wattmeter readings are equal and have same sign, the power factor of the circuit is

    (a) unity   (b) zero   (c) 0.8 leading   (d) 0.8 lagging

PART - B (5 x 2 = 10 Marks)

11. Calculate the equivalent resistance of the following circuit shown below.
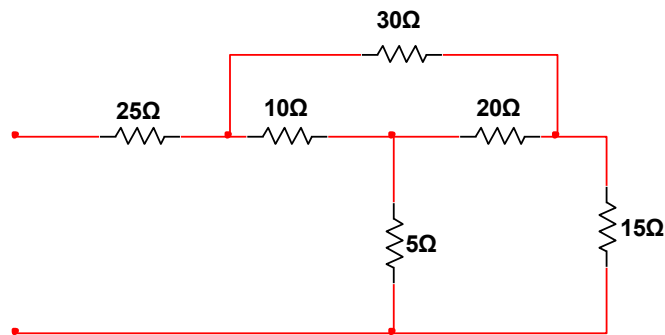
12. State the Thevenin's theorem.

13. Determine the quality factor for the series circuit consisting of $R = 10\ \Omega$, $L = 0.1\ H$ and $C = 10\ \mu F$.

14. Distinguish between the steady state and transient state response of an electrical circuit.

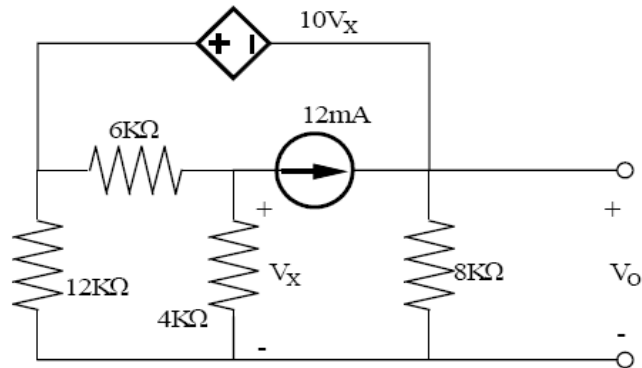15. Compare the 3 phase star with delta connected system.

PART - C (5 x 16 = 80 Marks)

16. (a) In the given circuit below calculate (i) the equivalent resistance across the terminals of the supply (ii) total current delivered by the source (iii) power delivered to 16 Ω resistor.   (16)

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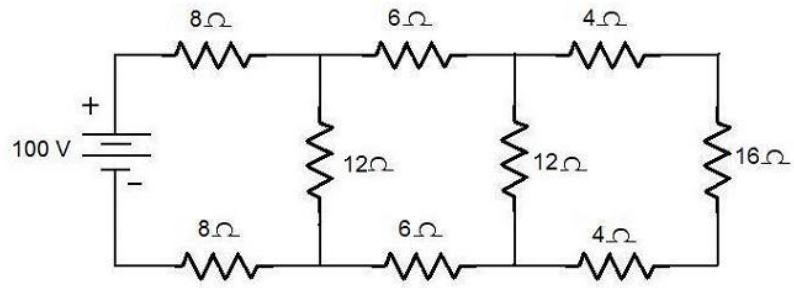
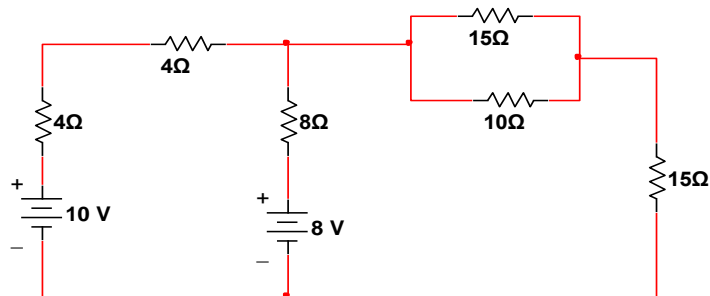Or

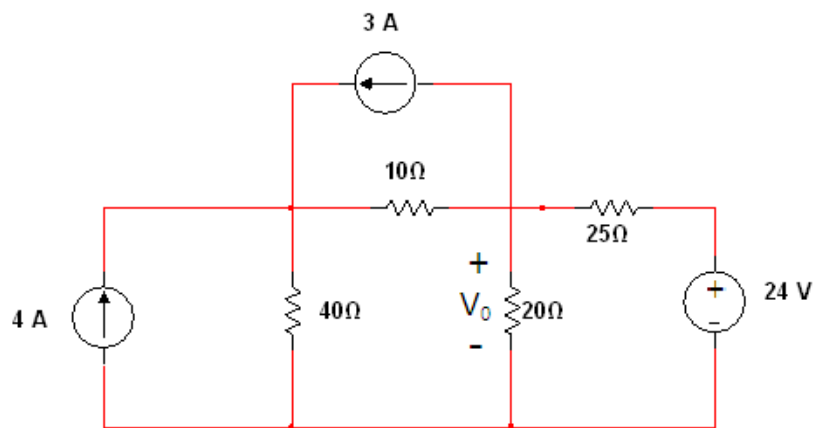(b) Calculate *Vo* from the following circuit shown below using mesh analysis. (16)

17. (a) Calculate the current in 10 Ω resistor of the network shown below using superposition theorem. (16)

Or

(b) Calculate the voltage V_0 for the given circuit below. (16)

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18. (a) State the condition for resonance in series RLC circuit and obtain the expression for resonant frequency. Derive the expression for bandwidth for a series RLC circuit as a function of resonant frequency.   (16)

Or

(b) (i) A coil of resistance 3 Ω and inductance 100 mH is connected in series with a 100 μF capacitor across a 220 V, 50 Hz supply. Calculate (1) Impedance of the circuit in polar form (2) the current (3) power factor and (4) voltage across each element.   (8)

(ii) A coil of 400 μH is magnetically coupled to another coil of 100 μH. The coefficient of coupling between two coils is 0.08. Calculate the inductance if two coils are connected in:

   (1) Series aiding   (2) Series opposing
   (3) Parallel aiding   (4) Parallel opposing   (8)

19. (a) Derive the expression for the current $i(t)$ in the series RC circuit: (a) with initial conditions (b) with relaxed initial conditions for a step input excitation, using Laplace transform technique.   (16)

Or

(b) A series RL circuit has $R = 25$ Ω and $L = 5$ H. A dc voltage of 100 V is applied at $t = 0$. Find (a) the equation for charging current (b) voltage across R and L (c) current in the circuit after $0.5s$ (d) the time at which the voltage drops across R and L are same.   (16)

20. (a) With a neat circuit and phasor diagram explain the three phase power and power factor measurement by two Wattmeter method.   (16)

Or

(b) Calculate the total input power and readings of the two Wattmeter connected to measure power in a three phase balanced load, if the reactive power input is 15 $KVAR$, and the load power factor is 0.8.   (16)

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