**B.E DEGREE EXAMINATIONS: MAY 2015**

Regulation 2013

Second Semester

**ELECTRICAL AND ELECTRONICS ENGINEERING**

U13EET201: Circuit Theory

**Time: Three Hours**          **Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. Kirchhoff's law is applicable to
   a) AC circuits only
   b) DC circuits only
   c) AC as well as DC circuits
   d) Passive network only

2. Find the value of current I in the figure 1, the value of resistor R is $(25+I/2)$ ohms, where I is current in amperes. …………………..

3. What is the response of series RC circuit as frequency increases
   a) Current increases
   b) Current decreases
   c) Remains unaltered
   d) None of the above

4. Value of power dissipated in the pure inductive circuit is ……………..

5. Apply Norton's theorem the circuit yields to
   a) equivalent current source
   b) equivalent impedance
   c) equivalent current source and impedance in series
   d) equivalent current source and impedance in parallel

6. What is the condition to obtain maximum power in the electric circuit …………

7. A coil with 1000 turns carrying a current of 8 A produces a flux of $6 \times 10^{-8}$ Wb. Find the inductance of the coil is
   a) 0.00075 H
   b) 0.0075 H
   c) 0.075 H
   d) 0.75 H

8. Two identical coupled inductors are connected in series. The measured inductances for the two possible series connections are 380 μH and 240 μH. Find their mutual inductance is

……………………

9. Which of the following is true for a three phase delta connected circuit

    a) Line voltage = phase voltage        b) Line current= phase current

    c) Line current = $1/\sqrt{3}$ phase voltage       d) Line current = $\sqrt{3}$ phase current

10. While measuring power of a three-phase balanced load by the two-wattmeter method, the readings are 100W and 250W. Find the power factor of the load is ………

## PART B (10 x 2 = 20 Marks)

11. Compare the series and parallel electric circuits.

12. Three resistors 10Ω, 5Ω and 20Ω are connected in star. What are the equivalent delta resistors?

13. Define RMS value.

14. Construct the frequency response of series and parallel RLC circuit.

15. Illustrate Thevenin's theorem.

16. State Reciprocity theorem.

17. In a coupled circuit having two coils, the value of L1, L2 and K are 5mH, 10mH and 0.8 respectively where K is the coefficient of coupling. Find the mutual inductance between the two coils.

18. Define coefficient of coupling.

19. List out the advantages of 3Φ system over 1Φ System?

20. Show the relations between phase and line values in a delta and star connected loads.

## PART C (5 x 14 = 70 Marks)

**Q.No. 21 is Compulsory**

21.        Explain the two wattmeter method of power measurement for the     3 phase balanced star connected load and also derive the expression for power factor of the load with its phasor diagram.

22. a) (i) Determine the value of current through the branch BD and the total current (10) delivered by the battery. Use Kirchhoff's laws in the figure 2.

         (ii) Explain source transformation rule.            (4)

b) (i) Find the current through 10Ω resistor using star delta conversion a circuit shown (10)
in the Figure 3

(ii) Find the equivalent resistance between A and B a circuit shown in the Figure 4 (4)

23. a) A resistor of 20 Ω, inductor of 0.2H and a capacitor of 150 µF are connected in
series and fed by a 230V, 50Hz ac supply. Find (i) $X_L$ (ii) $X_c$ (iii) Z (iv) I (v)
Power factor (vi) Apparent power (vii)Active power and reactive power

**(OR)**

b) A series RLC circuit with R = 10Ω, L = 10 mH and C = 1 µF has an applied
voltage of 200 V. Calculate the resonant frequency, the current in the circuit and
the voltage across the elements at resonance. Find also the quality factor and
band width for the circuit

24. a) (i) Determine the value of $V_2$ as the circuit shown in figure 5 such that the current (7)
through the impedance (3+j4) Ω is zero.

(ii) Find the power dissipated in the 10 Ω resistor use node voltage method for the circuit shown in figure 6. (7)

**(OR)**

b) Find the current through (3+j4)Ω branch using superposition theorem for the circuit shown in figure 7.

25. a) (i) Illustrate the dot rule for coupled coils. (4)

(ii) Find the voltage across the 10 Ω resistor for the coupled circuit shown in figure 8 (10)

**(OR)**

b) (i) Comparison of magnetic and electric circuits (4)

(ii) A circular iron ring has a mean circumference of 1.5m and a cross sectional area of $0.01m^2$. A saw- cut of 4 mm wide is made in the ring. Calculate the magnetizing current required to produce a flux of 0.8 mWb in the air gap if the ring is wound with a coil of 175 turns. Assume relative permeability of iron as 400 and leakage factor 1.25. (10)

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