



EE 301

III Semester Diploma (Electrical) Examination, August 2011  
CIRCUIT THEORY

Time : 3 Hours

Max. Marks : 75

- Instructions:** 1) Answer all questions in Part A and either (a) or (b) of each question in Part B.
- 2) Each question carries 1 (one) mark in Part A and 12 (twelve) marks in Part B.

PART A

Answer all questions :

(15×1=15)

1. Define electrical field intensity.
2. State KCL.
3. Draw the circuit diagram of series connection of three resistors.
4. The circuit is having 7 branch and 3 nodes. How many equations are possible in this circuit?
5. Define resistance and its unit.
6. State the super position theorem.
7. What is meant by RMS value?
8. Draw the vector diagram of RL series circuit.
9. What is the impedance of RC series circuit?
10. What is the relationship between phase current and line current in the star system?
11. Why the 3 wattmeter methods are rarely used?
12. Write the formula of power factor in the two wattmeter method.
13. What is transient analysis?
14. Write some of Laplace transforms formula used in the integral equations.
15. Write the voltage drop across the capacitor in the DC transient RL circuit.



Fig. 1

OR

P.T.O.



## PART - B

## CIRCUIT THEORY

Answer all questions :

(5×12=60)

16. a) State and explain Coulomb's laws of electrostatics. A current 1.5 A is passed through a coil of iron wire which has a cross sectional area of  $0.015 \text{ cm}^2$ . If the resistivity of iron is  $10 \times 10^{-8} \Omega \text{ m}$ . The voltage across the ends of the coil is 20 volts.

- What is the length of the wire ?
- What is the conductivity of the wire ?

OR

b) Three resistors  $R_1$ ,  $R_2$  and  $R_3$  are connected in parallel across a supply voltage of 240 V. If  $R_2 = 2R_1$ ,  $R_3 = 3R_1$  and the total power taken by the circuit is 480 watts. Calculate the power in each resistor.

17. a) Find the current in  $6 \Omega$  resistor using mesh current analysis in the Fig. 1.

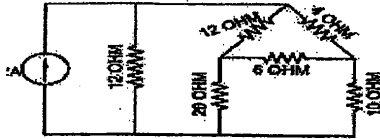


Fig. 1

OR

b) Derive the equation for delta-star transformation.

18. a) A circuit consists of a resistance  $R$  ohm and inductance  $L$  Henry connected in series. If it is connected to a 240 V, 50 Hz supply mains it consumes 300 watts and voltage drop across  $R$  is 100 V. Calculate the value of inductance  $L$ .

OR

b) Explain the series RLC resonance circuit and derive the resonance frequency and bandwidth.



19. a) Derive the relationship between line and phase voltage in delta connected circuit.

OR

b) Two wattmeter connected to measure the power of a 3 phase circuit indicated 2500 W and 500 W respectively. Find the power factor of the circuit when

a) Both the readings are positive and

b) The later reading is obtained after reversing the connection of the current coil of the wattmeter.

20. a) Explain RC Decay transient.

OR

b) Explain the construction details of RLC transient circuit and derive the current expression.

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11) (a) Draw the relationship between time and the voltage in the connected circuit.

OR

(b) The wattmeter connected to measure the power of a pure inductor indicated 1.500 W and 200 W respectively. Find the power factor of the circuit when

(i) both the readings are positive and

(ii) The first reading is obtained after reversing the connection of the current coil of the wattmeter.

20) Explain KVL in a network.

OR

(i) If  $K$  is the conversion factor of KVL in a network circuit and  $\delta$  is the constant expression.