



COMBINED I & II SEMESTER B.TECH (ENGINEERING) DEGREE EXAMINATION
(2K Scheme), APRIL 2013

A1 2K 109 - BASIC ELECTRICAL ENGINEERING
(Common to EE, EC, IC, BM & BT)

Time : Three Hours

Maximum : 100 Marks

PART A

Answer all the questions. Each question carries 5 marks

1. What is meant by Dot convention. With an example, demonstrate how dots can be applied in a coupled circuit.
2. A 2 mesh circuit has 3 resistors, 2Ω each. The central limb common to both the meshes have one resistor and other two resistors are placed in such a way that each mesh has 2 resistors. The first mesh has a dc voltage source of 12V and the second mesh has dependent voltage source of $2y$ Volts where y is the current drawn from first source. Find the various branch currents and node voltages of the circuit.
3. Explain the concepts of natural and transient response in the context of a series RL circuit with dc excitation
4. State and explain constant charge theorem
5. Obtain the rms value of a trapezoidal waveform
6. Explain the concept of resonance in a parallel RLC circuit
7. Obtain the Y equivalent of a Delta connection of resistance of R Ohms in each side
8. What is meant by symmetrical components. Explain

(8 * 5 = 40marks)

PART B

Answer four(4) full questions. Each full question carries 15 marks. Missing data may suitably be assumed.

9. (a) Derive an expression for the energy stored in a magnetic field
- (b) With an example, illustrate the effect of dependent sources on the nodal conductance matrix and mesh resistance matrix

(6 + 9 = 15marks)

OR

- (c) A delta connected network with impedance of $5 + j12\Omega$ in each side of the delta is connected to an ac voltage source of $2 + j1$ Volts. Obtain an equivalent network having a current source and a single impedance.
- (d) What is a magnetic circuit. A magnetic circuit has a closed iron ring form with an air gap of 2mm and area of cross section $6mm^2$. Obtain the flux through the path if the Ampere turns linked is 200 and the length of the magnetic iron path is 400mm and area of cross section is $6mm^2$. Assume suitable value for the relative permeability of iron ring specimen.

(8 + 7 = 15marks)

Turn over

10. (a) An RLC parallel circuit with 5Ω resistor in first parallel path, an inductor of $2H$ in second parallel path and a capacitance of $1F$ in third parallel path, is fed by a voltage source of $12V$. Assuming zero initial conditions, obtain an expression for current drawn from the supply and current through the elements
(b) Explain the significance of time constant in the performance of an RC circuit

(10 + 5 = 15marks)

OR

- (c) Derive the mathematical expression for the step response of a series RLC circuit and sketch the responses under different conditions of parameter values
11. (a) Derive an expression for the alternating voltage induced in a rotating conductor and hence find the form factor, peak factor
(b) Two alternating quantities are represented as $v_1(t) = 20\sin(\omega t + 30)$ and $v_2(t) = 10\cos(\omega t + 45)$. Obtain their representation in Cartesian form and polar form. Find the results of (a) addition (b) subtraction (c) multiplication and (d) division of these quantities in polar form as well as in Cartesian form

(15marks)

(7 + 8 = 15marks)

OR

- (c) Obtain the phasor diagram representation of the circuit, power triangle representation of power drawn from the sources shown in Figure 1. Solve for all branch currents, node voltages and total power consumed

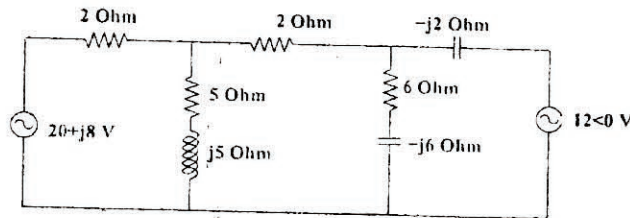


Figure 1: Figure for Question 11(c)

(15marks)

12. (a) Write the theoretical derivation and practical method of 3 phase power measurement when a balanced delta connected load is drawing power from a balanced 3ϕ supply. Draw the phasor diagram.

(15marks)

OR

- (b) Explain how a unbalanced three phase system with mutual coupling can be analyzed using symmetrical components
(c) Determine the line current in a 3ϕ system with a line voltage of $400V$ that supplies 1600 Watts to Delta connected balanced load at a lagging power factor of 0.8 . Also find the impedance of each phase.

(7 + 8 = 15marks)