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Question Paper Code: 41433

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

Third Semester

Electronics and Communication Engineering

14UEC303 - CIRCUIT THEORY

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The number of independent loops for a network with n nodes and b branches is

   (a) n-1 (b) b-n
   (c) b-n+1 (d)independent for the number of nodes

2. Mesh analysis makes use of the basic equation

   (a) *[V] = [Z] [I]* (b) *[I] = [Z] [V]*
   (c) *[V] = [Y] [I]* (d) *[I] = [Y] [V]*

3. Superposition theorem is not applicable to networks containing

   (a) nonlinear elements (b) dependent voltage source
   (c) dependent current source (d)transformers

4. Maximum power gets transferred to the load when the load impedance is

   (a) equal to zero (b) equal to one
   (c) equal to source impedance (d) none of the above

5. What is the *Q* (Quality factor) of a series circuit that resonates at 6 *kHz*, has equal reactance of 4 *kilo-ohms* each, and a resistor value of 50 *ohms*?

   (a) 0.001 (b) 50 (c) 80 (d)4.0

6. The Q-factor in a series R-LC circuit at resonance is

(a) $\frac{1}{R}\sqrt{\frac{C}{L}}$ (b) $\frac{1}{L}\sqrt{\frac{C}{R}}$ (c) $\frac{1}{R}\sqrt{\frac{L}{C}}$ (d) $\frac{1}{R^2}\sqrt{\frac{C}{L}}$

7. Self-inductance of a magnetic coil is proportional to

(a)N (b)$1/N$ (c)N^2 (d)$1/N^2$

8. In two wattmeter method of power measurement, when the power factor of load is zero leading or lagging the two wattmeter will give_____ reading.

(a) Zero (b) equal
(c) equal and opposite (d) not equal

9. A two - port network is symmetrical if

(a) $Z_{11}Z_{22} - Z_{12}Z_{21} = 1$ (b) $AD - BC = 1$
(c) $h_{11}h_{22} - h_{12}Z_{21} = 1$ (d) $Y_{11}Y_{22} - Y_{12}Y_{21} = 1$

10. An ideal filter should have

(a) Zero attenuation in the pass band
(b) Infinite attenuation in the pass band
(c) Zero attenuation in the attenuation band
(d) Infinite attenuation in the attenuation band

PART - B (5 x 2 = 10 Marks)

11. A 10 *A* current source has a source resistance of 100 *ohm*. What will be the equivalent voltage source?

12. State Norton's theorem.

13. Give the expressions for series and parallel resonance frequency.

14. Write the symmetrical components of three phase system.

15. A two port networks has the following *Z* parameters $Z_{11} = 3\ \Omega$, $Z_{12} = 1\ \Omega$ $Z_{21} = 5\ \Omega$ and $Z_{22} = 1\ \Omega$. Find the admittance matrix.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Apply Kirchhoff's voltage law to determine the voltage across the capacitor for the circuit shown in the figure 1. (10)

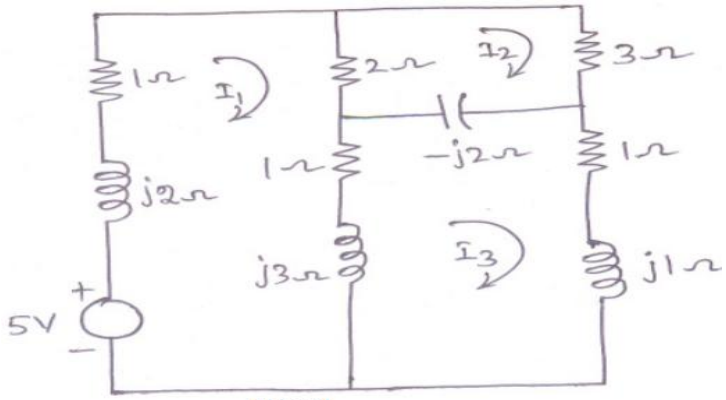

Figure 1

(ii) Define the following terms.

(1) Graph of a network (2) Tree (3) Chord. (6)

Or

(b) (i) Find V_{BD} by nodal analysis for the circuit shown in the figure 2 (10)

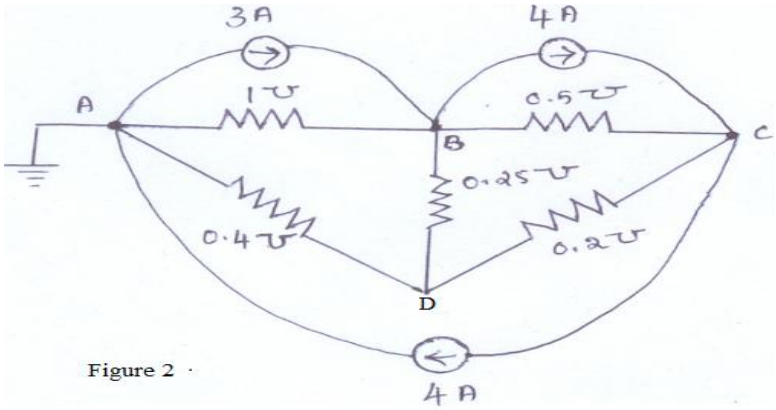

Figure 2

(ii) Obtain the expression for star-delta transformation. (6)

17. (a) Determine the current in the 10-Ω resistor for the circuit shown in Figure 4 by using superposition theorem. (16)

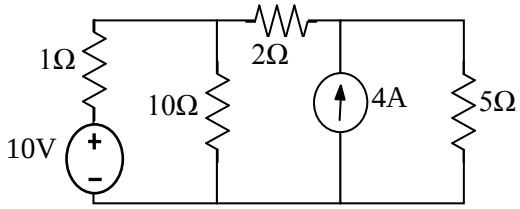

Figure 4

Or

(b) In the circuit of figure 5, determine the impedance that can be connected across the terminals *A*and*B* for the maximum power. Also estimate the maximum power. (16)

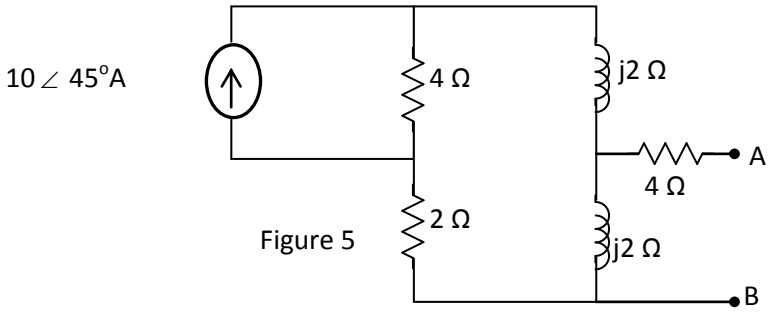

Figure 5

18. (a) Obtain the resonant frequency, Q-factor, band width and the voltage across the capacitor at resonance for the series RLC circuit having $R = 7.5\Omega$, $L = 6\mu H$ and $C = 40pF$, with a supply voltage of 0.5 *volts*. (16)

Or

(b) (i) Derive the equation for transient response of RLC circuit for DC input. (12)

(ii) Draw the pole –zero diagram of the given network function

$$I(s) = \frac{5s}{(s+1)(s^2+4s+8)} \quad (4)$$

19. (a) Two coils connected in series have an equivalent inductance of 0.8 *H* when connected in aiding and an equivalent inductance of 0.4 *H* when connected in opposing. Determine the mutual inductance. Calculate the self-inductance of the coils, by taking $k = 0.55$. (16)

Or

(b) Three coils each having a resistance of 20 Ω and a reactance of 15 Ω are connected in (i) star and (ii) delta, across a three-phase, 400 *V*, 50 *Hz* supply. Calculate in each case, the readings on two Watt meters connected to measure the power input. (16)

20. (a) The Z parameters of a two port network are Z_{11} = 10 o*hms*; Z_{22} = 15 o*hms*; $Z_{12} = Z_{21}$ = 5 *ohms*. Find the equivalent *T* network and *ABCD* parameters. (16)

Or

(b) (i) Design a low pass filter having cut – off frequency of 2 *KHz*, to operate with a terminal load resistance of 500 Ω . (8)

(ii) Design a high pass filter having a cut-off frequency of 1 *KHz* with a load resistance of 600 Ω . (8)