Total No. of printed pages = 8

EC 131302

Roll No. of candidate | | | | | | | | | | |

2017

B.Tech. 3rd Semester End-Term Examination

Electronics and Communication

NETWORK ANALYSIS

Full Marks – 100 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No.1 and any *six* from the rest.

1. Answer any *ten* questions : (10 × 1 = 10)

(a) Superposition theorem is not valid for _____.

(i) voltage responses

(ii) current responses

(iii) power responses

(iv) none of the above

(b) One ampere means the flaw of _____.

(i) One coulomb each minute

(ii) One electron per second

(iii) One coulomb per second

(iv) One coulomb per hour

[Turn over

(c) Which of the following elements if nonlinear?

(i) Capacitor (ii) Inductor

(iii) Resistor (iv) Transistor

(d) When two coils having self inductances of L_1 and L_2 are coupled through a mutual inductance M, what is the co-efficient of coupling k?

(e) Define a graph of a network.

(f) A practical voltage source consists of

(i) an ideal voltage source in series with an internal resistance

(ii) an ideal voltage source in parallel with an internal resistance

(iii) both (i) and (ii) are correct

(iv) none of the above

(g) A tree has

(i) a closed path (ii) no closed path

(iii) none (iv) both (i) and (ii)

(h) For a two part network to be reciprocal

(i) $Z_{11} = Z_{22}$ (ii) $Y_{21} = Y_{12}$

(iii) $h_{21} = -h_{12}$ (iv) $AD - BC = 0$

(i) The laplace transform of $e^{at} \cos \alpha t$ is equal to

(i) $\frac{1}{(s+a)^2}$ (ii) $\frac{e^{-as}}{(s+a)^2}$

(iii) $\frac{s-\alpha}{(s-\alpha)^2+\alpha^2}$ (iv) $\frac{s+a}{(s-\alpha)^2+\alpha^2}$

(j) The pole – zero pattern of a particular network is shown in figure 1. It is that of an

(i) LC network (ii) RC network

(iii) RL network (iv) None

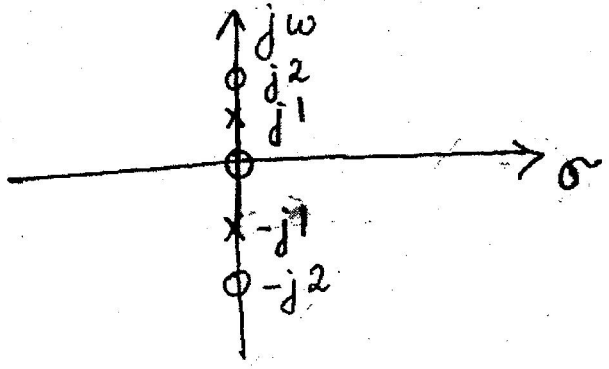

Figure. 1

(k) Consider the following polynomials.

$P_1 = s^8 + 2s^6 + 4s^4$

$P_2 = s^6 - 3s^2 + 2s^2 + 1$

$P_3 = s^4 + 3s^3 + 3s^2 + 2s + 1$

Which one of these polynomial is not Hururitz?

(i) P_1 (ii) P_2

(iii) P_3 (iv) all

(l) Maximum power is transferred when load resistance is

(i) equal to source resistance

(ii) equal to half of the source resistance

(iii) none of the above

(iv) equal to zero

2. (a) Find the equivalent resistance between A and B in the network of Figure 2. (5)

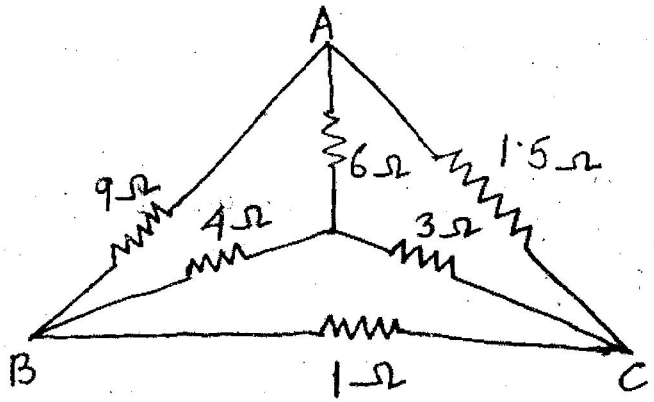

Figure 2

(b) Find currents I_1, I_2, I_3 for the network shown in Figure 3. (5)

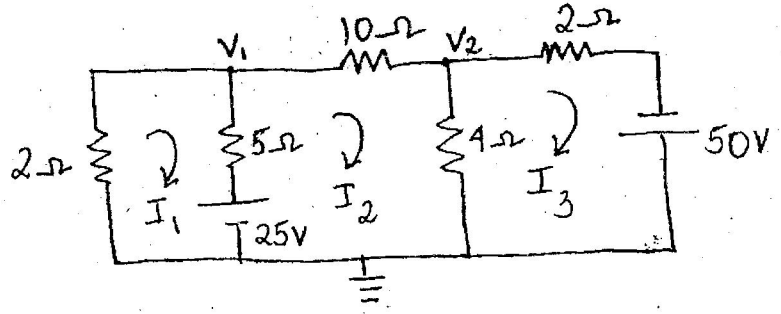

Figure 3

(c) State Thevenin's theorem. What are the steps followed in Thevenin's theorem? Explain with example. (5)

3. (a) Determine the voltage across $(2+j5)\Omega$ impedance for the network shown in Figure 4 using superposition theorem. (5)

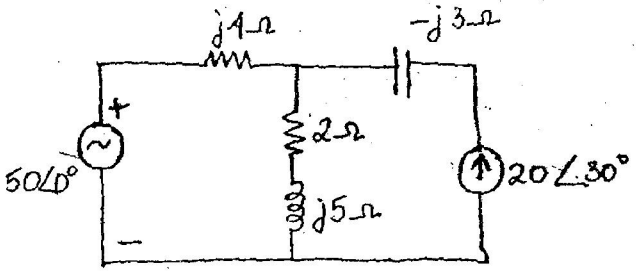

Figure 4

(b) Draw the phasor diagram of series RLC circuit and what happens at resonance. (5)

(c) The voltage and current in a circuit are given by $V = 120\angle 30^\circ\, V$ and $I = 2\angle -15^\circ\, A$. If the circuit works on 50Hz supply. Determine impedance, resistance, reactance, power factor and power loss considering the circuit as a simple series circuit. (5)

4. (a) Two coils with a co-efficient of coupling of 0.6 between them are connected in series as to magnetise in (i) same direction (ii) opposite direction. The total inductance in the same direction is 1.5 H and in opposite direction is 0.5 H. Find the self-inductance of the coils. (5)

(b) Find the equivalent inductance of the network shown in Figure 5. (5)

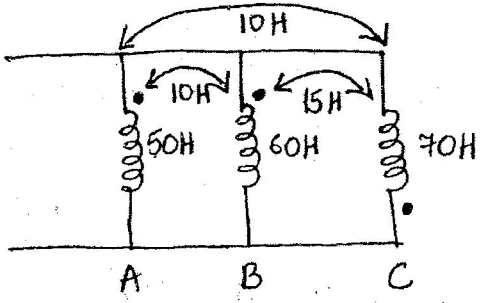

Figure 5

(c) Find the voltage V_2 in the circuit shown in Figure 6; such that the current in the loop 1 (left hand loop) is zero. (5)

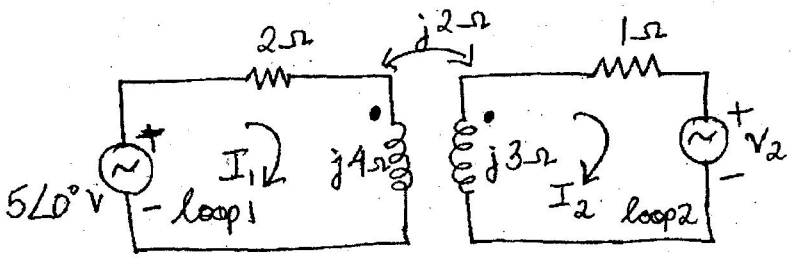

Figure 6

5. (a) In the network of Figure 7, the switch is closed at $t=0$. With the capacitor uncharged, find value for i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t=0^+$. (7)

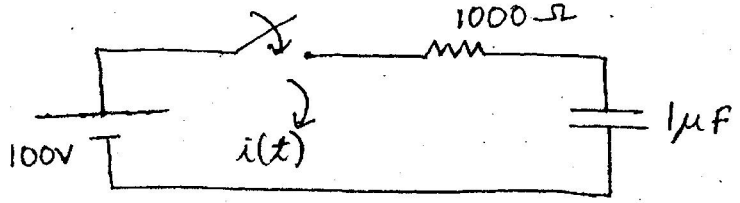

Figure 7

(b) The network of Figure 8 was initially in the steady state with the switch in the position a. At $t=0$, the switch goes from a to b. Find an expression for voltage $v(t)$ for $t>0$. (8)

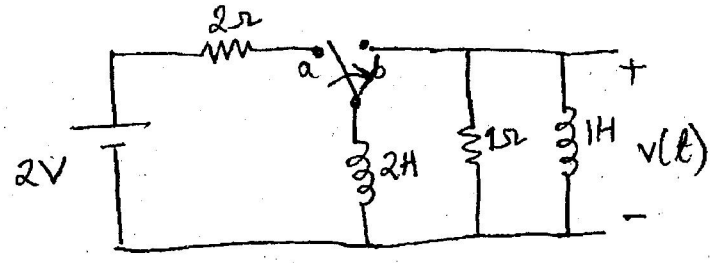

Figure 8

6. (a) Define the followings : Tree, Tie set matrix, Cut set matrix, loop. (8)

(b) For the circuit shown in Figure 9, write down (i) incidence matrix (ii) tie set matrix. (7)

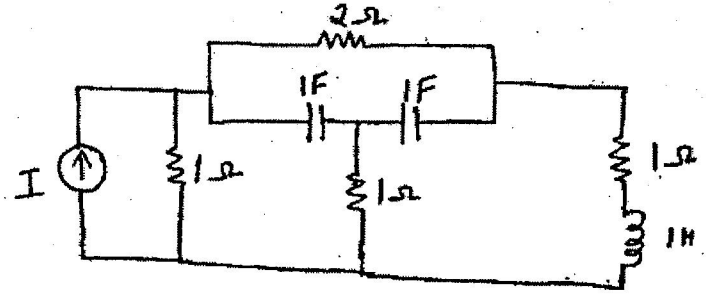

Figure 9

7. (a) Check whether the polynomial $P(s)=2s^4+5s^3+6s^2+3s+1$ is Hururitz. (3)

(b) Realise the foster form I and II of the following RC impedance function. (6 + 6)

$$Z(s)=\frac{2(s+2)\ (s+4)}{(s+1)\ (s+3)}$$

8. (a) Find the Z-parameters for the network shown in Figure 10. (7)

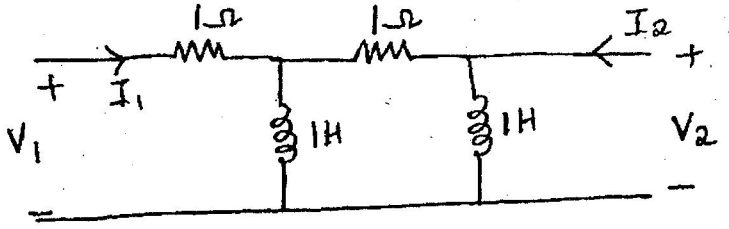

Figure 10

(b) Find h parameters for the network shown in Figure 11. (8)

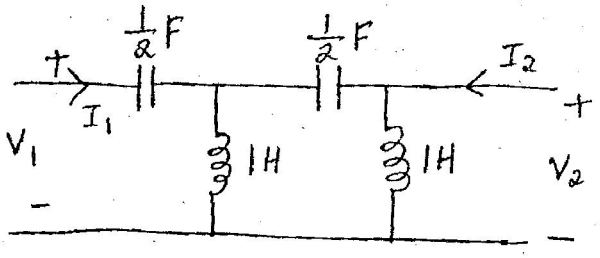

Figure 11

9. (a) Find Millman's equivalent for left of the terminal A–B in Figure 12. (5)

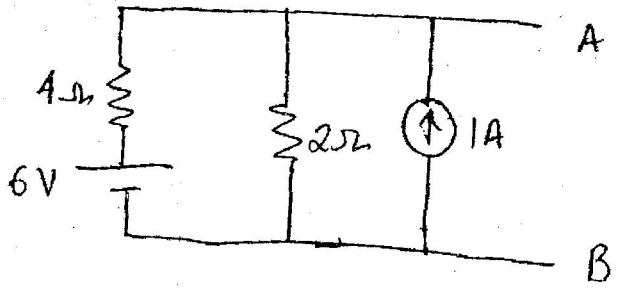

Figure 12

(b) Write short notes on (any *two*) : $(2 \times 5 = 10)$

(i) Source transformation

(ii) Duality

(iii) Maximum power transfer theorem.