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BIEL-028

DIPLOMA – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (DECVI) / ADVANCED LEVEL CERTIFICATE COURSE IN ELECTRONICS AND COMMUNICATION ENGINEERING (ACECVI)

00703

Term-End Examination

December, 2016

BIEL-028 : CIRCUITS AND NETWORKS

Time : 2 hours *Maximum Marks : 70*

***Note :** Attempt any **five** questions. Question no. 1 is **compulsory**. All questions carry equal marks. Symbols used have their usual meaning. Use of scientific calculator is permitted.*

1. (a) Norton's equivalent circuit consists of

(i) voltage source in parallel with impedance

(ii) voltage source in series with impedance

(iii) current source in series with impedance

(iv) current source in parallel with impedance

(b) The maximum power transfer theorem can be applied

(i) only to d.c. circuits

(ii) only to a.c. circuits

(iii) to both d.c. and a.c. circuits

(iv) to neither of the two

(c) What is the impedance of an ideal parallel resonant circuit without resistance in either branch ?

(i) Zero

(ii) Inductive

(iii) Capacitive

(iv) Infinite

(d) The differential equation of an electric current passing through a circuit containing resistance R and an inductance L in series with the voltage source V is given by

(i) $V = R \int i dt + Li$

(ii) $V = Ri + L \int \left(\frac{di}{dt}\right) dt$

(iii) $V = Ri + L \int i dt$

(iv) $\frac{d^2 i}{dt^2} + \frac{R}{L} \frac{di}{dt} = 0$

(e) The time constant of a series RC circuit is

(i) $\frac{1}{RC}$

(ii) $\frac{R}{C}$

(iii) RC

(iv) e^{-RC}

(f) The driving point impedance is defined as

(i) the ratio of transform voltage to transform current at the same port

(ii) the ratio of transform voltage at one port to the transform current at the other port

(iii) Both (i) and (ii)

(iv) None of the above

(g) For a two-port network to be reciprocal

(i) $Z_{11} = Z_{22}$

(ii) $Y_{21} = Y_{22}$

(iii) $h_{21} = -h_{12}$

(iv) $AD - BC = 0$ *7×2=14*

2. (a) Use Mesh analysis method to find out the current through the 20 Ω resistor as shown in figure 1. 7

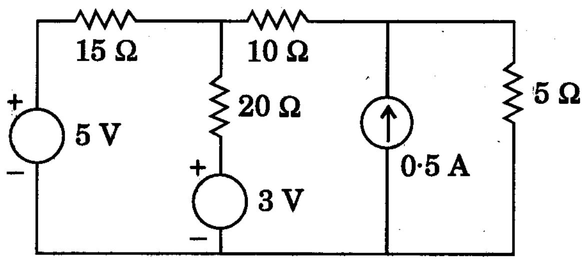

Figure 1

(b) A source network is shown in figure 2.

(i) What impedance Z_L when connected to A – B transfers maximum power in Z_L ?

(ii) What is the value of maximum power ? 7

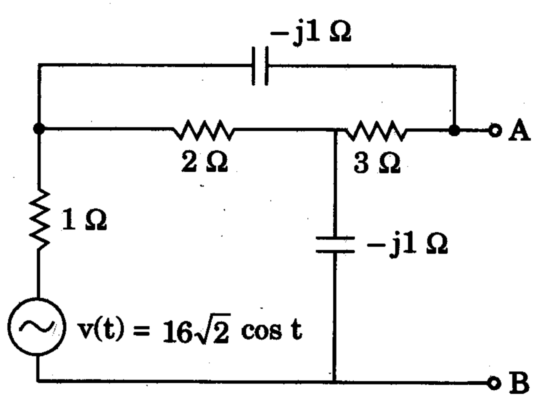

Figure 2

3\. (a) Find the resonant frequency for a series R-L-C circuit if L = 32 μH and C = 450 pF. Determine the required value of R for the quality factor Q = 0·05. Find the lower and upper cut-off frequencies and bandwidth. 7

(b) Figure 3 shows a network in which there is no initial voltage across the capacitor and no initial current through the inductor. At t = 0, the switch K is closed.

Find i_1, i_2, $\frac{di_1}{dt}$ and $\frac{di_2}{dt}$ at $t = 0^+$. 7

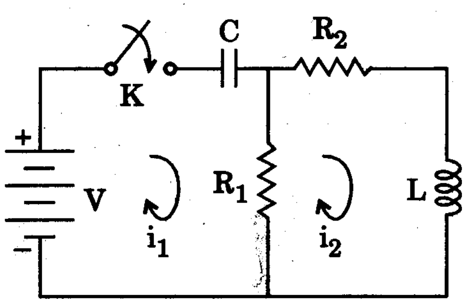

Figure 3

4\. (a) A resistive bridged-T, two-port network is shown in figure 4. Find the values of

(i) $\frac{V_2}{V_1}$, (ii) $\frac{V_2}{I_1}$, (iii) $\frac{I_2}{V_1}$, and (iv) $\frac{I_2}{I_1}$. 7

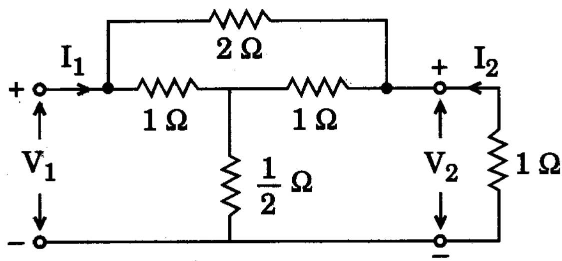

Figure 4

(b) For the network shown in figure 5, pole-zero pattern has been represented in figure 6.

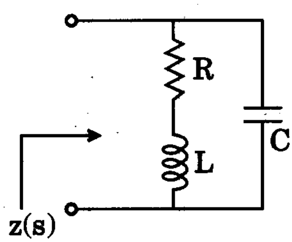

Figure 5

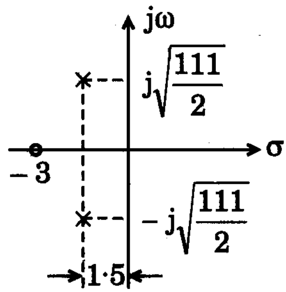

Figure 6

Find the numerical values of R, L and C. Given z(0) = 1. 7

5. (a) Find the h-parameters of the network shown in figure 7. 7

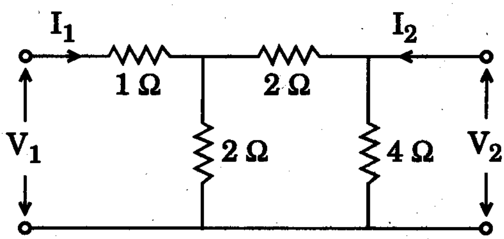

Figure 7

(b) Derive the required condition for a two-port network to be reciprocal. 7

6. (a) Design K-type band pass filter having a design impedance of 500 Ω and cut-off frequencies 1 kHz and 10 kHz. 7

(b) The image impedances of the network in figure 8 are $Z_{i_1} = 100\ \Omega$ and $Z_{i_2} = 50\ \Omega$. Calculate the values of the impedances Z_1 and Z_2. 7

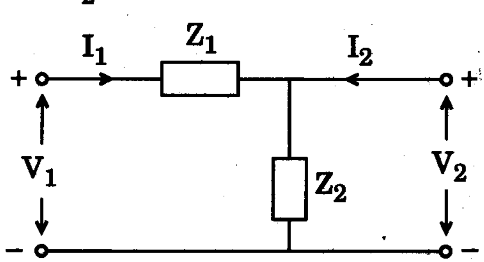

Figure 8

7. Write short notes on any ***four*** of the following : $4\times3\frac{1}{2}=14$

(a) Norton's Theorem

(b) Resonance Curve and Quality Factor

(c) Composite Low Pass Filter

(d) Symmetrical π-attenuator

(e) Cascade Connection of Two-port Network