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

Term-End Examination

00006

June, 2015

BIEL-028 : CIRCUITS AND NETWORKS

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. Question no. **1** is **compulsory**. Use of scientific calculator is permitted.*

1. (a) To calculate Thevenin's equivalent in the following 2

(i) all independent voltage sources are opened and all independent current sources are short circuited.

(ii) both voltage and current sources are open circuited.

(iii) all voltage and current sources are shorted.

(iv) all voltage sources are shorted while current sources are opened.

(b) The characteristic impedance of a low pass filter in attenuation band is 2

(i) purely imaginary

(ii) zero

(iii) complex quantity

(iv) real value

(c) Laplace transform of a unit impulse function is 2

(i) s

(ii) 0

(iii) e^{-s}

(iv) 1

(d) A network function is said to have simple pole or simple zero if 2

(i) the poles and zeros are on the real axis.

(ii) the poles and zeros are repetitive.

(iii) the poles and zeros are complex conjugates to each other.

(iv) the poles and zeros are not repeated.

(e) Step response of Series RC circuit with applied voltage V is of the form 2

(i) $i(t) = \frac{V}{R} e^{-t/RC}$

(ii) $i(t) = \frac{V}{R}(1 - e^{-t/RC})$

(iii) $i(t) = \frac{-V}{R} e^{-t/RC}$

(iv) $i(t) = \frac{-V}{R}(1 - e^{-t/RC})$

(f) Higher the value of Q of a series circuit 2

(i) sharper is its resonance

(ii) greater is its bandwidth

(iii) broader is its resonant curve

(iv) narrower is its bandwidth

(g) If the given network is symmetrical, then according to the symmetric theorem 2

(i) $y_{21} = y_{12}$

(ii) $y_{11} = y_{22}$

(iii) $y_{11} = -y_{22}$

(iv) $y_{11} = y_{12}$

2. (a) State the initial value theorem in the Laplace transform. What is the value of the function at $t = 0^+$, if its $F(s) = \frac{4(s+25)}{s(s+10)}$? 7

(b) A sinusoidal voltage of rms value 20 V and frequency equal to frequency of resonance is applied to a Series RLC circuit having resistance R = 20 Ω, inductance L = 0·05 H and capacitance C = 0·05 μF. Calculate the value of current and voltages across R, L and C. 7

3. (a) Calculate the driving point admittance of the network shown in Figure 1. 7

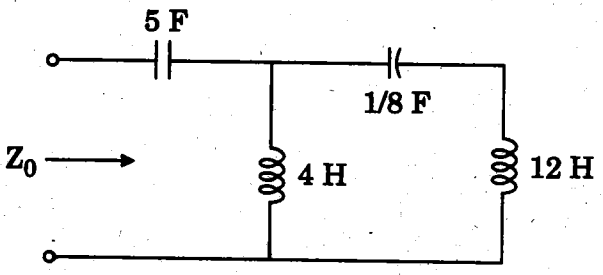

Figure 1

(b) A transform voltage is given by $V(s) = \frac{3s}{(s+1)(s+4)}$. Plot the pole zero plot in the s-plane and obtain the time domain response. 7

4. (a) Find out the ABCD parameters of the network shown in Figure 2. 7

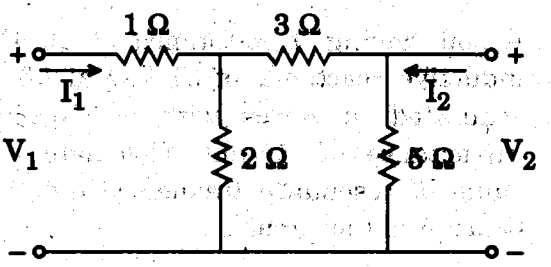

Figure 2

(b) Explain Z-parameters and also draw an equivalent circuit of the Z-parameter model of the two-port network. 7

5. (a) State Thevenin's theorem. Using Thevenin's theorem, calculate the current in the branch XY, for the circuit given in Figure 3. 8

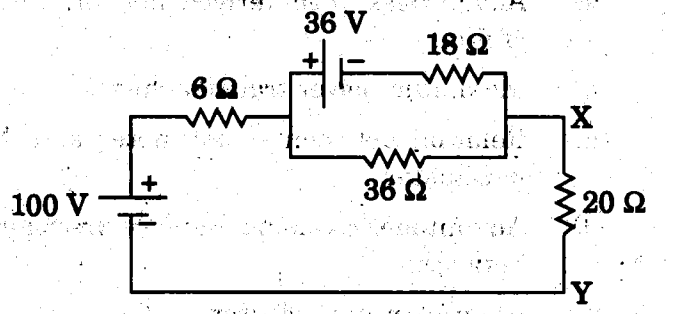

Figure 3

(b) Define an ideal voltage source and an ideal current source. 6

6. (a) Derive the expression of resonant frequency for a parallel RLC circuit in terms of Q, R, L and C. 7

(b) A coil having a resistance of 20 Ω and inductive reactance of 31·4 Ω at 50 Hz is connected in series with a capacitor of capacitance of 10 mF. Calculate (i) the value of resonance frequency and (ii) the Q factor of the circuit. 7

7. (a) Design a symmetrical bridged T-attenuator to provide attenuation of 60 dB and to work into a line of characteristic impedance 600 Ω. 7

(b) Design a prototype low pass filter, assuming cut-off frequency ω_c. 7

8. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Advantages of m-derived networks in case of filters

(b) Maximum power transfer theorem

(c) Relation between h-parameter and ABCD parameter

(d) Advantages of using Laplace transform in networks

(e) Characteristics of filters