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BIEL-028

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

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Term-End Examination

December, 2014

BIEL-028 : CIRCUITS AND NETWORKS

Time : 2 hours *Maximum Marks : 70*

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

1. Select the correct answer : *7×2=14*

(a) How many cycles does a sine wave go through in 10 s when its frequency is 60 Hz ?

(i) 10 cycles

(ii) 60 cycles

(iii) 600 cycles

(iv) 6 cycles

(b) A current of 100 mA through an inductive reactance of 100 Ω produces a voltage drop of

(i) 1 V

(ii) 6·28 V

(iii) 10 V

(iv) 100 V

(c) While applying Thevenin's theorem, the Thevenin's voltage is equal to

(i) short circuit voltage at the terminals

(ii) open circuit voltage at the terminals

(iii) voltage of the source

(iv) total voltage available in the circuit

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

(i) Zero

(ii) Inductive

(iii) Capacitive

(iv) Infinite

(e) The time constant of a series RL-circuit is

(i) RL

(ii) L / R

(iii) R / L

(iv) $e^{-R/L}$

(f) The inverse Laplace transform of $\frac{6}{s^4}$ is

(i) 3

(ii) t^2

(iii) t^3

(iv) 3t

(g) The initial value of $x(t) = 20 - 10t - e^{25t}$ is

(i) 20

(ii) 19

(iii) 10

(iv) 25

2. (a) Determine the voltage drop across the 10 Ω resistance in the circuit shown in Figure 1.

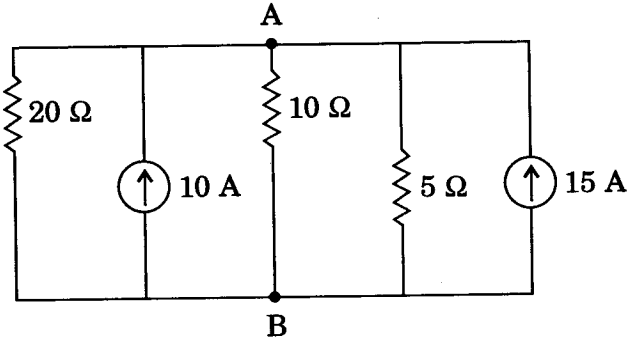

Figure 1

(b) Find Thevenin's equivalent circuit for the circuit shown in Figure 2 across A and B. *2×7=14*

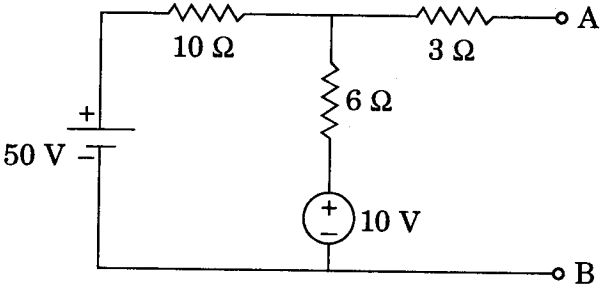

Figure 2

3. (a) Two impedances $Z_1 = (20 + j10)\ \Omega$ and $Z_2 = (10 - j30)\ \Omega$ are connected in parallel and this combination is connected in series with $Z_3 = (30 + jX)$. Find the value of 'X' which will produce resonance.

(b) In the circuit shown in Figure 3 an inductance of 0·1 H having a Q of 5 is in parallel with a capacitor. Determine the value of capacitance and coil resistance at resonant frequency of 500 rad/sec. *2×7=14*

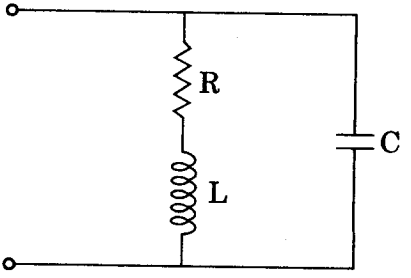

Figure 3

4. (a) A series RC circuit consists of a resistor of 10 Ω and capacitor of 0·1 F as shown in Figure 4. The switch 'S' is closed at t = 0. Obtain the current equation. Determine the voltages across the resistor and the capacitor. (Using Classical method)

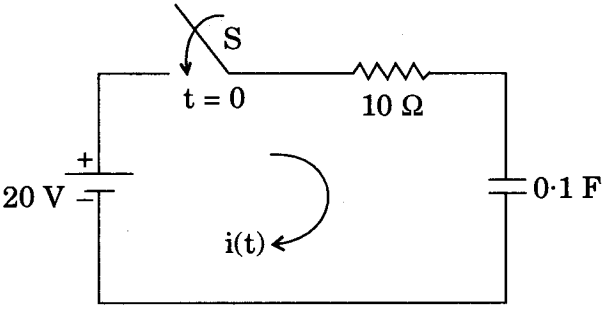

Figure 4

(b) Determine the value of I in the given circuit in Figure 5 using Laplace transform. Assume all initial conditions to be zero. *2×7=14*

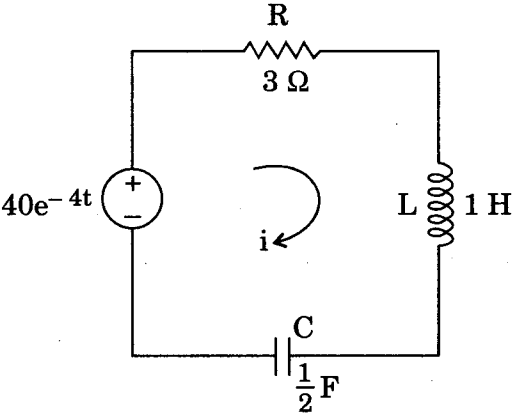

Figure 5

5. (a) Design a T-attenuator to give an attenuation of 60 dB and to work in a line of 500 Ω impedance.

(b) A T-section filter is shown in Figure 6. Calculate the value of cut-off frequency and determine the iterative impedance of the network at 1·5 kHz. *2×7=14*

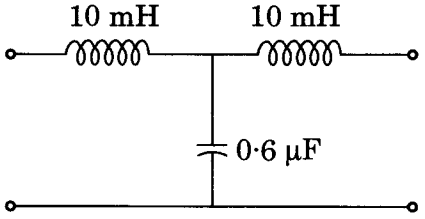

Figure 6

6. (a) For the given network function draw the pole-zero diagram and hence obtain the time-domain response $I(s) = \frac{3s}{(s+1)(s+3)}$.

(b) For the network shown in Figure 7 obtain the transfer functions $G_{21}(s)$ and $Z_{21}(s)$ and the driving point impedance $Z_{11}(s)$. *2×7=14*

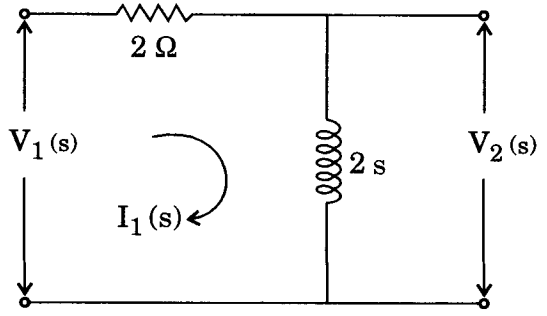

Figure 7

7. (a) Express hybrid "h" parameters in terms of "Z" (impedance) parameters.

(b) Derive the condition for reciprocity in terms of 'g' parameters. $2 \times 7 = 14$

8. Write short notes on any ***two*** questions from each section (a) and (b) :

(a) (i) Resonance

(ii) Step function

(iii) Source Transformation $2 \times 3\frac{1}{2} = 7$

(b) (i) Symmetry of two port network

(ii) Reciprocity of two port network

(iii) Superposition principle $2 \times 3\frac{1}{2} = 7$