DIPLOMA IN ELECTRICAL ENGINEERING (DELVI)

Term-End Examination

00164

June, 2017

BIEE-033 : ELECTRICAL CIRCUIT THEORY

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. Question no. **1** is **compulsory**. All questions carry equal marks. Use of scientific calculator is allowed. Assume missing data, if any.*

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

(a) At $t = 0^+$ with zero initial condition, which of the following acts as an open circuit ?

(i) Inductor

(ii) Capacitor

(iii) Resistor

(iv) All of these

(b) When a source is delivering maximum power to load, the efficiency of a circuit

(i) is always 50%

(ii) depends upon circuit parameters

(iii) is always 75%

(iv) None of these

(c) The relation between Norton's resistance (R_N) and Thevenin's resistance (R_{TH}) for a given circuit

(i) $R_N > R_{TH}$

(ii) $R_N < R_{TH}$

(iii) $R_N = R_{TH}$

(iv) None of these

(d) As per superposition theorem, the nature of the circuit is

(i) Non-linear

(ii) Linear

(iii) Both (i) and (ii)

(iv) None of the above

(e) Power factor of pure capacitor is

(i) Unity

(ii) Zero

(iii) Infinite

(iv) 0·707 leading

(f) Combined resistance value of a group of resistors connected in parallel will be

(i) more than the largest resistor

(ii) more than the smallest resistor

(iii) less than the smallest resistor

(iv) between the value of the smallest and largest resistors

(g) In a circuit, a voltage of $\bar{V} = (-1 + j)$ volts produces a current of $\bar{I} = (-1 - j)$ ampere. The circuit is

(i) Pure capacitance

(ii) Pure inductance

(iii) Combination of R-L

(iv) Combination of R-C

2. (a) Find the current in the 1 Ω resistor of the network shown in Figure 1, using Thevenin's theorem. 7

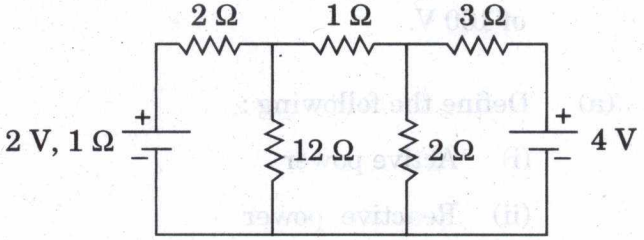

Figure 1

(b) A coil of resistance 10·05 Ω and inductance 400 mH is connected in series with a 0·396 μF capacitor. Find : 7

(i) The resonant frequency

(ii) Band width

(iii) Upper and lower half-power frequencies

3. (a) Find the value of energy stored in the inductor, voltage across resistor and inductor for the circuit shown in Figure 2 under steady-state conditions. 7

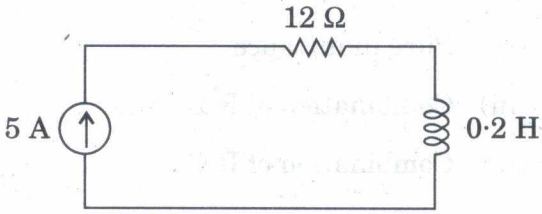

Figure 2

(b) If a resistor dissipates energy of 250 W, find the resistance for the terminal voltage of 100 V. 7

4. (a) Define the following : 7

(i) Active power

(ii) Reactive power

(iii) Apparent power

(b) In a series RLC circuit, derive the expression for resonance frequency. 7

5. (a) Find the quality factor of a series RLC circuit, having resonant frequency of 10 kHz and band width of 500 Hz. 7

(b) State Thevenin's theorem and write its limitations. 7

6. (a) Find the equivalent resistance of the circuit shown in Figure 3 along the terminals A and B. 7

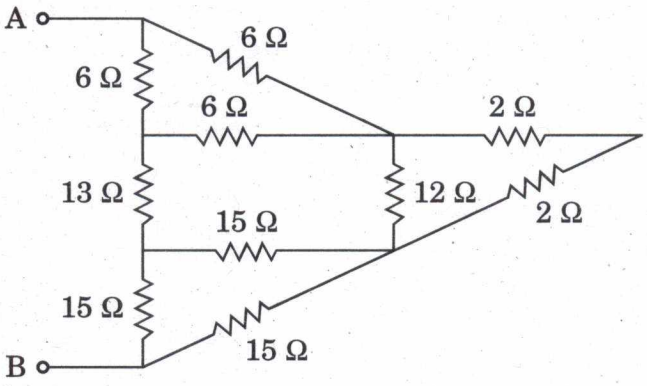

Figure 3

(b) Explain duality of networks with suitable examples. 7

7. (a) Find the current in the 10 Ω resistor using superposition theorem as shown in Figure 4. *10*

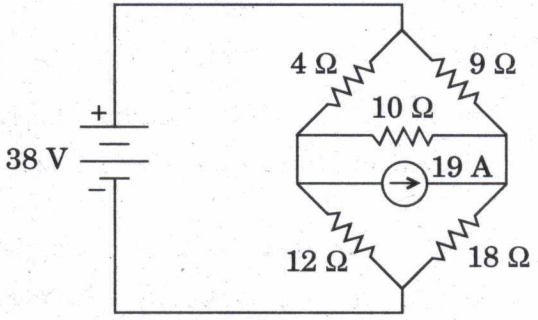

Figure 4

(b) What do you understand by quality factor of a circuit ? *4*