JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY
Electronics and Communication Engineering
Electrical Science-I (15B11EC111)
Tutorial Sheet: 1

Q1. [CO1] Using only 1K resistors, synthesize a resistor of 3/5 K and 5/3 K. You can use maximum 4 resistors in each case.

Q2. [CO1] Find the effective resistance between terminals A and B for the networks given in Fig. 1.1. [**Ans.** (*a*) 12 Ω; (*b*) 5 Ω; (*c*) 10*R*/3 (d) 3 Ω (e) 4 Ω]

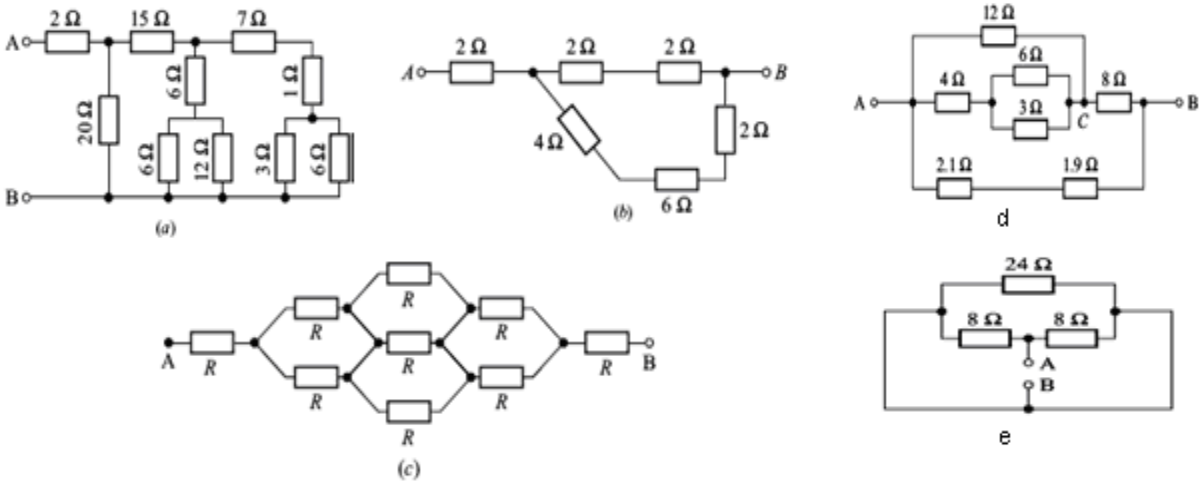

Fig. 1.1

Q3. [CO1] The resistance of two coils is 25 ohms when connected in series, and 6 ohms when connected in parallel. Determine the individual resistances of the two coils.

[**Ans.** 15 Ω**,** 10 Ω]

Q4. [CO1] Calculate the current drawn from a 12-V supply with internal resistance 0.5 Ω by the infinite ladder network, each resistance being 1 ohm, in Fig. 1.2.

[**Ans.** 3.71 A]

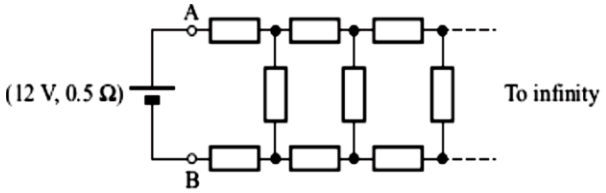

Fig. 1.2

Q5. [CO1] A 4 mF capacitor has the current waveform shown in Fig. 1.3. Assuming that v(0)=10 V, sketch the voltage waveform v(t).

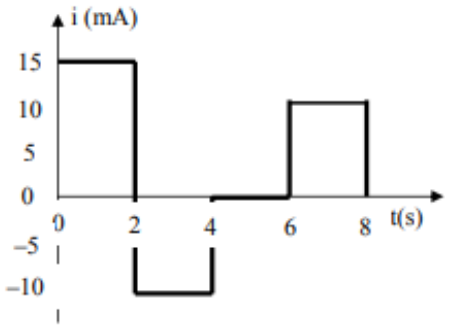

Fig. 1.3

Q6. [CO1] The current i(t) in a 2H inductor connected in a telephone circuit changes according to

$$i(t) = \begin{cases} 0 & t \le 0 \\ 4t & 0 < t \le 2 \\ -4t + 16 & 2 < t \le 4 \end{cases}$$

Where unit of time is second and the unit of current is mA. Determine the power p(t) absorbed by the inductor and energy w(t) stored in the inductor.

Ans. $\boldsymbol{p(t)} = \begin{cases} \mathbf{0} & \boldsymbol{t \le 0} \\ \mathbf{32t\mu W} & \mathbf{0 < t \le 2} \\ \mathbf{(32t - 128)\mu W} & \mathbf{2 < t \le 4} \end{cases}$, $\boldsymbol{w(t)} = \begin{cases} \mathbf{0} & \boldsymbol{t \le 0} \\ \mathbf{16t^2 \mu J} & \mathbf{0 < t \le 2} \\ \mathbf{(16t^2 - 128t)\mu J} & \mathbf{2 < t \le 4} \end{cases}$

Q7. [CO1] Consider the circuit shown in Fig. 1.4 with $v(t) = 12e^{-8t}V$ and $i(t) = 5e^{-8t}A$ for t ≥ 0. Both v(t) and i(t) are zero for t < 0. Find the power supplied by this element and the energy supplied by the element over the first 100 ms of operation.

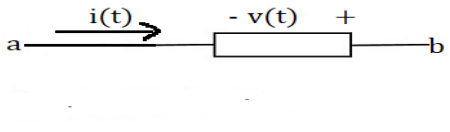

Fig. 1.4

Ans. $\boldsymbol{p(t) = 60e^{-16t}W}$ **and W = 2.99 J**