B.E. / B.Tech. (Electronics & Communication / Telecommunication Engineering)
Model Curriculum Semester-III

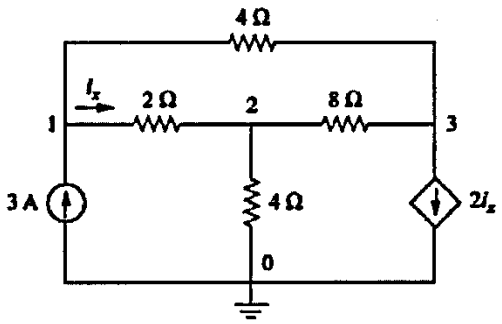
SE105 / 005 - Network Theory

P. Pages : 4 **GUG/W/24/13910**

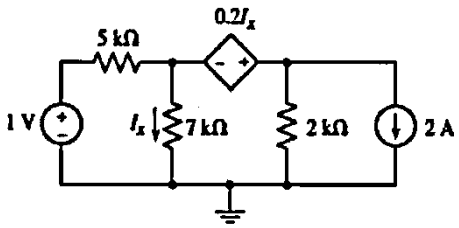
Time : Three Hours * 5 5 2 2 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Assume suitable data wherever necessary.
3. Diagrams and Chemical equation should be given wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.

1. A) Determine the number of branches and nodes in the circuit of Fig. Also determine the power absorbed by each element. **8**

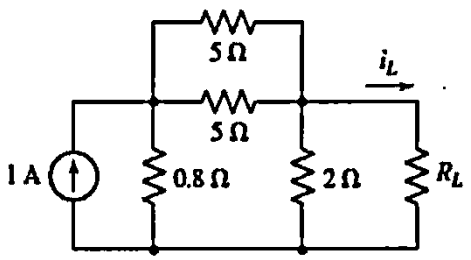


B) Employ superposition theorem to obtain a value for the current I_x as labeled in Fig. **8**

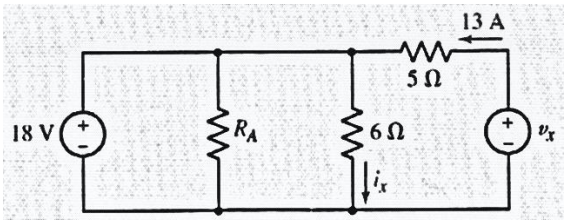


OR

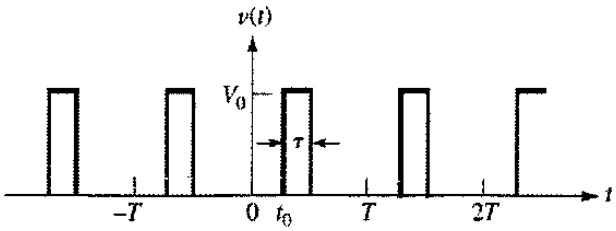
2. A) i) Obtain the Norton equivalent of the network connected to RL in Fig. **12**
ii) Obtain the Thevenin equivalent of the same network.
iii) Use either to calculate i_L for $R_L = 0\Omega, 1\Omega, 4.923\Omega$ and 8.107Ω.



B) Count the number of branches and nodes in the circuit in Fig. If $i_x = 3\,A$ and the 18 V source delivers 8 A of current, what is the value of R_A? **4**



3. A) A certain function f(t) is a train of rectangular pulses of amplitude V_0 and duration τ, recurring periodically every T seconds, as shown in fig. Find the exponential Fourier series for f(t). **8**



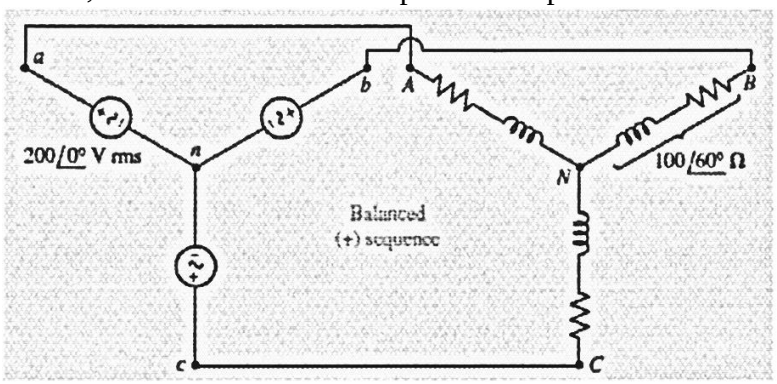
B) Evaluate the Fourier transform at $\omega = 12$ for the time function. **8**

a) $4u(t) - 10\,\delta(t)$ b) $5e^{-8t}u(t)$

c) $4\cos(8t)\,u(t)$ d) $-4\,sgn(t)$

OR

4. A) For the circuit of Fig. find both the phase and line currents, and the phase and line voltages throughout the circuit; then calculate the total power dissipated in the load. **8**



B) A periodic waveform f(t) is described as follows: f(t) = -4, 0 < t < 0.3; f(t) = 6, 0.3 < t < 0.4; f(t) = 0,0.4 < t < 0.5; T = 0.5. Evaluate (a) a_0; (b) a_3; (c) b_3; (d) c_3. **8**

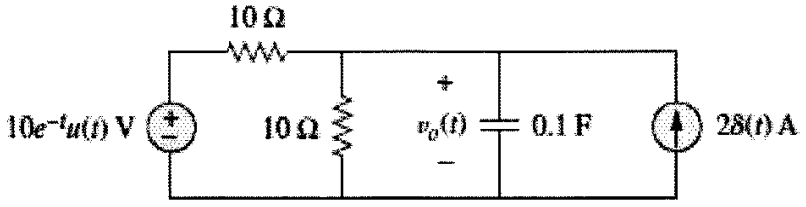
5. A) Determine the inverse Laplace transform of **8**

i) $F_1(s) = 5 + \dfrac{6}{s+4} - \dfrac{7s}{s^2+25}$

ii) $F_2(s) = \dfrac{s^2+12}{s(s+2)\,(s+3)}$

iii) $F_3(s) = \dfrac{10s^2+4}{s(s+1)\,(s+2)^2}$

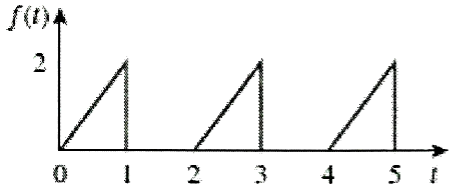
B) Find $v_0(t)$ in the circuit of Fig. Assume $v_0(0) = 5\,V$. **8**



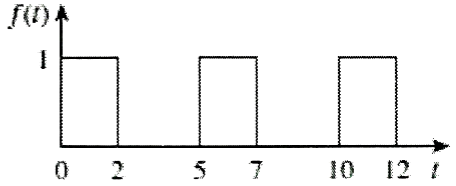
OR

6. A) Calculate the Laplace transform of the periodic function as shown in fig. below **8**

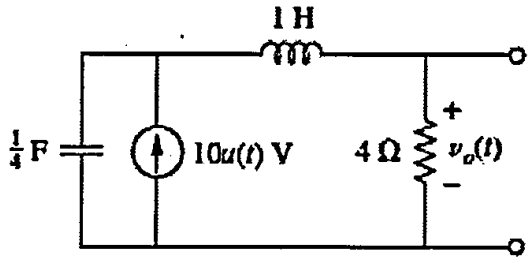
i)



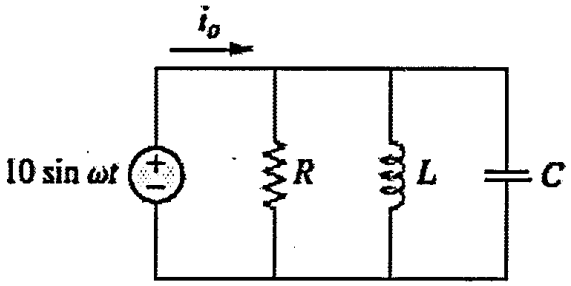
ii)



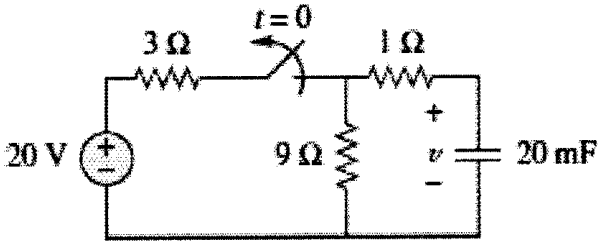
B) Find $v_0(t)$ in the circuit of fig. assuming zero initial conditions. **8**



7. A) In the parallel resonance circuit of Fig. $R = 8\ K\Omega$, $L = 0.2\,mH$ and $C = 8\,\mu F$. (i) Find the resonant frequency and the half-power frequencies. (ii) Calculate the quality factor and bandwidth. (iii) Determine the power dissipated at ω_0, ω_1 and ω_2. **8**



B) The switch in the circuit in Fig. has been closed for a long time, and it is opened at t = 0. Find $v_0(t)$ f or $t > 0$. Calculate the initial energy stored in the capacitor. **8**

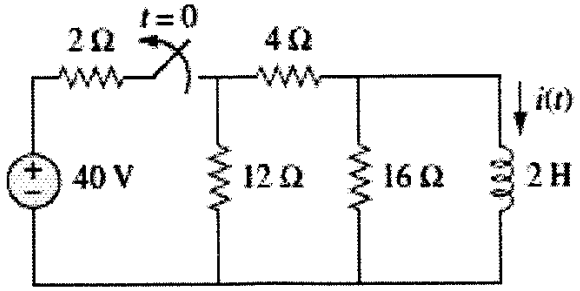


OR

8. A) A parallel resonance circuit has a resistance of and half-power frequencies of 86 kHz and 90 kHz. Determine: **8**

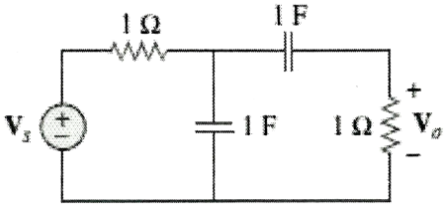
a) The capacitance
b) The inductance
c) The resonant frequency
d) The bandwidth
e) The quality factor

B) The switch in the circuit of Fig. has been closed for a long time. At t = 0 the switch is opened. Calculate i(t) for t > 0. **8**

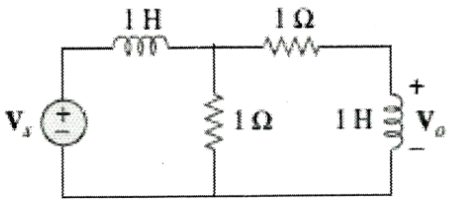


9. A) Determine the center frequency and bandwidth of the bandpass filters in Fig. **8**

i)



ii)



B) Define a Band Pass Filter. Draw the circuit diagram of Band pass filter. Obtain its transfer function and draw the frequency response. **8**

OR

10. A) Show that for a bandstop filter, **8**

$$H(s) = \frac{s^2 + \omega_0{}^2}{s^2 + sB + \omega_0{}^2}, s = j\omega$$

Where B = bandwidth of the filter and ω_0 is the center frequency.

B) Define a band stop filter. Draw the circuit diagram of band stop filter. Obtain its transfer function and draw the frequency response. **8**

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