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

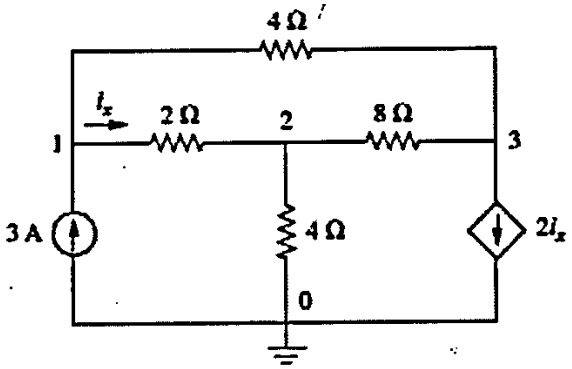
005 / SE105 - Network Theory

P. Pages : 4 **GUG/S/25/13910**

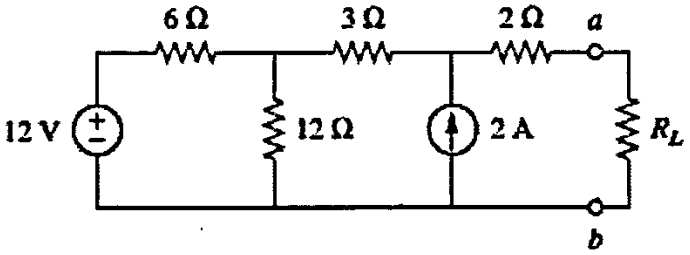
Time : Three Hours * 2 3 2 0 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
3. 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**

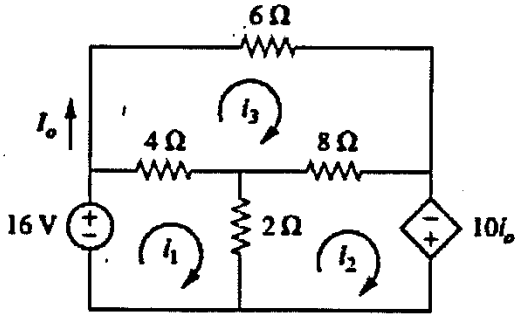


b) Find the value of R_L for maximum power transfer in the circuit of Fig. Find the maximum power. **8**

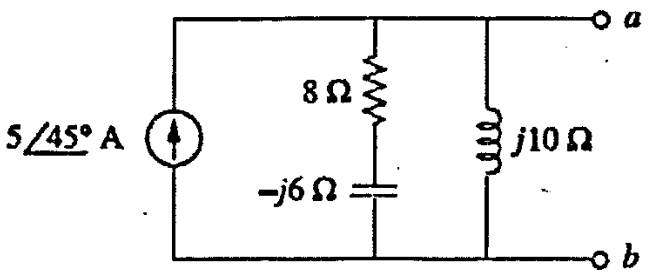


OR

2. a) Determine the number of branches and nodes in the circuit of Fig. Using mesh analysis, find I_0 in the circuit. **8**



b) Determine the Thevenin's & Norton's equivalent circuit at the terminals a-b for the circuit shown in fig. **8**



3. a) Define Fourier series. Derive the Exponential Fourier series starting from Trigonometric Fourier series. What is the effect of Even Symmetry and Odd Symmetry on Trigonometric Fourier series coefficients? **8**

b) Find the Fourier transform of the following functions: **8**

i) $\delta(t-t_0)$

ii) $e^{j\omega_0 t}$

iii) $\cos(\omega_0 t)$

OR

4. a) A balanced three-phase three-wire system has a Y-connected load. Each phase contains three loads in parallel: $-j100\Omega$, 100Ω and $50 + j50\Omega$. Assume positive phase sequence with Vab = 400/0° V. Find (a) Van; (b) IaA; (c) the total power drawn by the load. **8**

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

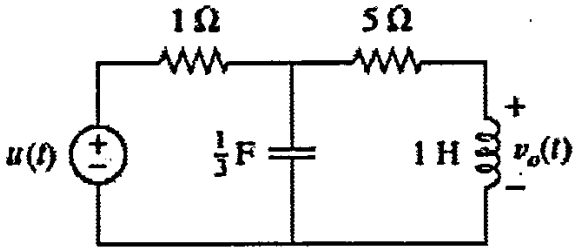
5. a) Find the Laplace transform of **8**

i) $f_1(t) = \delta(t) + 2u(t) - 3e^{-2t}u(t)$

ii) $f_2(t) = (\cos(2t) + e^{-4t})\,u(t)$

iii) $f_3(t) = t^2 \sin(2t)\,u(t)$

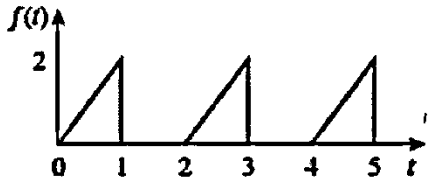
b) Find $v_0(t)$ in the circuit of Fig., assuming zero initial conditions. **8**



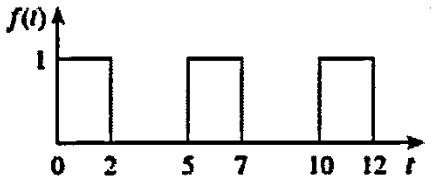
OR

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

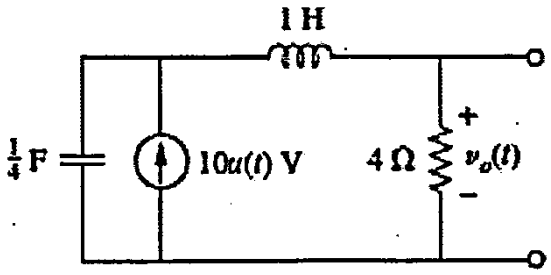
i)



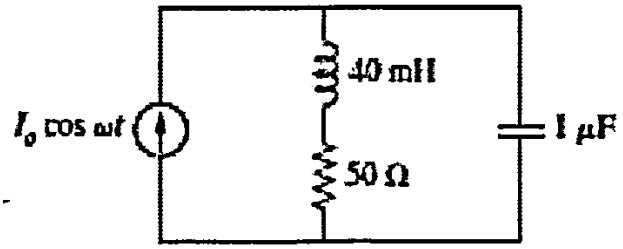
ii)



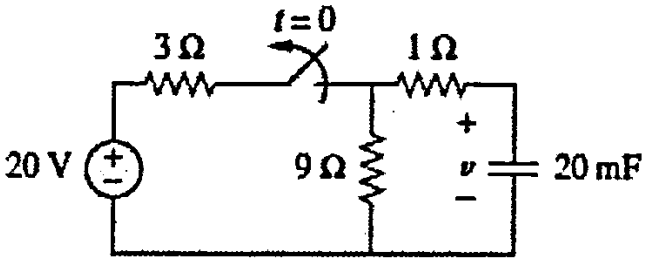
b) Find $v_0(t)$ in the circuit of Fig., assuming zero initial conditions. **8**



7. a) For the 'tank' circuit in fig., find the resonant frequency. **8**

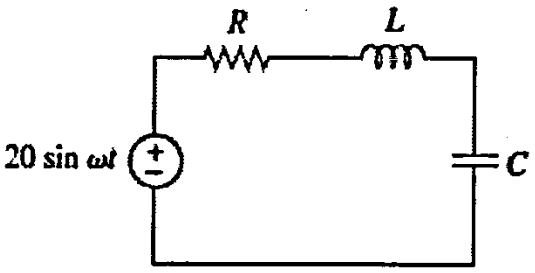


b) The switch in the circuit in fig. has been closed for a long time, and it is opened at t = 0. Find $v_0(t)$ f or t > 0. Calculate the initial energy stored in the capacitor. **8**

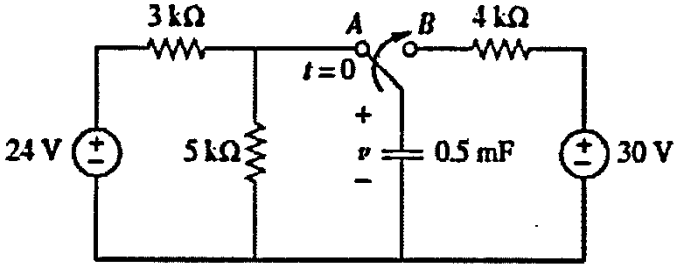


OR

8. a) In the series resonance circuit of Fig., $R = 2\Omega$, $L = 1mH$ and $C = 0.4\mu F$. (i) Find the resonant frequency and the half-power frequencies. (ii) Calculate the quality factor and bandwidth. (iii) Determine the amplitude of the current at ω_0, ω_1 and ω_2. **8**



b) The switch in Fig. has been in position A for a long time. At t = 0 the switch moves to B. Determine $v(t)$f or t > 0 and calculate its value at t = 1s and 4s. **8**



9. a) Show that for a bandpass filter, **8**

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

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

b) Define a Low Pass Filter. Draw the circuit diagram of RC low 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 High Pass Filter. Draw the circuit diagram of RL high pass filter. Obtain its transfer function and draw the frequency response. **8**

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