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

105 / 005 - Network Theory

P. Pages : 5 **GUG/W/23/13910**

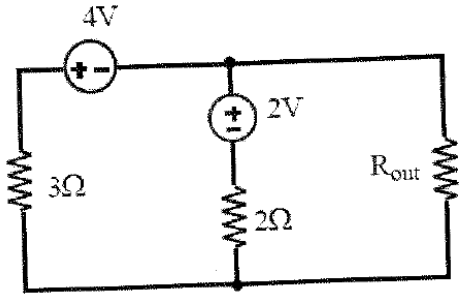
Time : Three Hours Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Use of slide rule, Logarithmic tables, Drawing instruments is permitted.
6. Use of non programmable calculator is permitted.

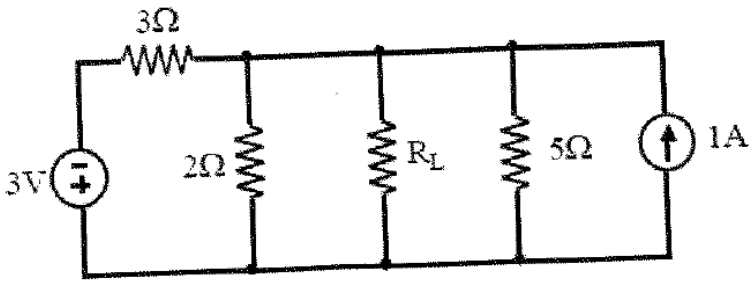
1. a) For the circuit drawn in Fig, **7**

(a) Determine the Thevenin equivalent connected to R_{out}

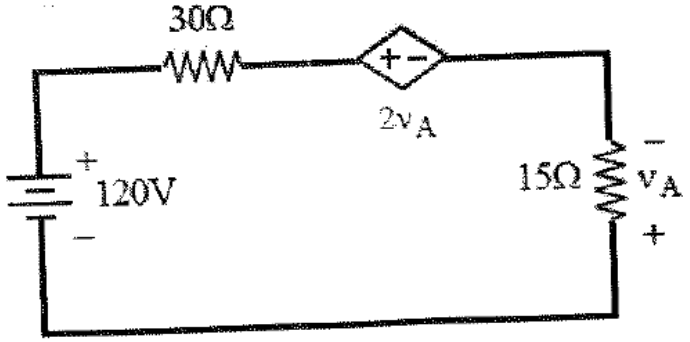
b) Choose Rout such that maximum power is delivered to it.



b) For the circuit of Fig., what value of R_L will ensure it absorbs the maximum possible amount of power? **5**

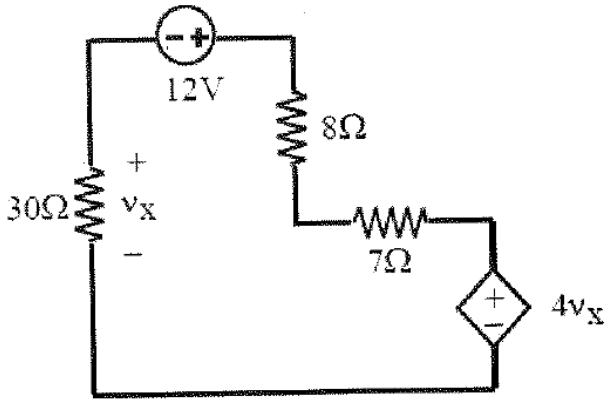


c) Compute the power absorbed in each element for the circuit shown in Fig, **4**

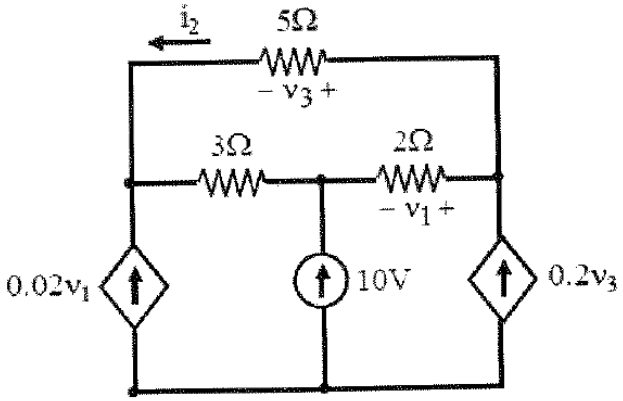


OR

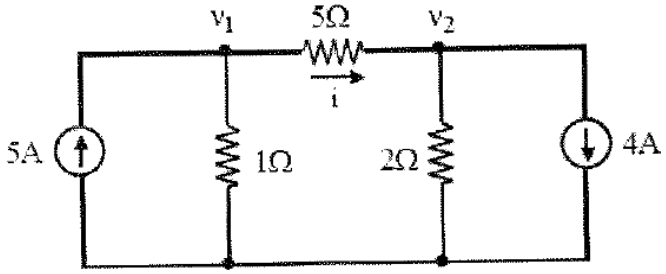
2. a) In the circuit of Fig. Find the power absorbed by each of the five elements in the circuit. **6**



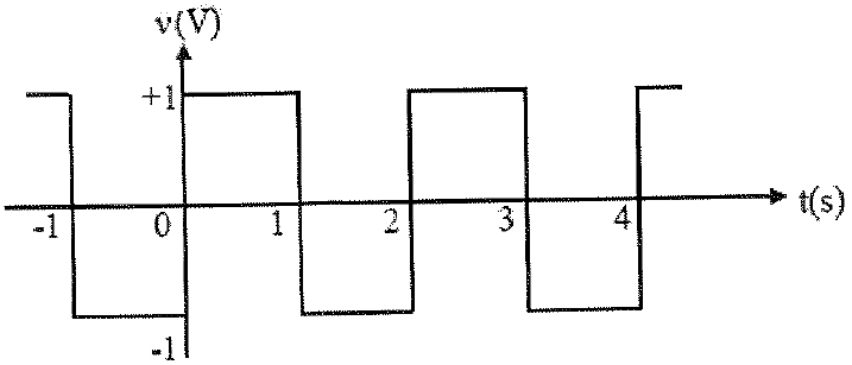
b) Determine the current i2 as labeled in the circuit of Fig., with the assistance of nodal analysis. **6**



c) In the circuit of Fig., determine the current labeled i with the assistance of nodal analysis techniques. **4**



3. a) Write the Fourier series for the voltage waveform shown in fig. **8**



b) Determine the amplitude of the line current in a three-phase system with a line voltage of 300V that supplies 1200 W to a. **8**

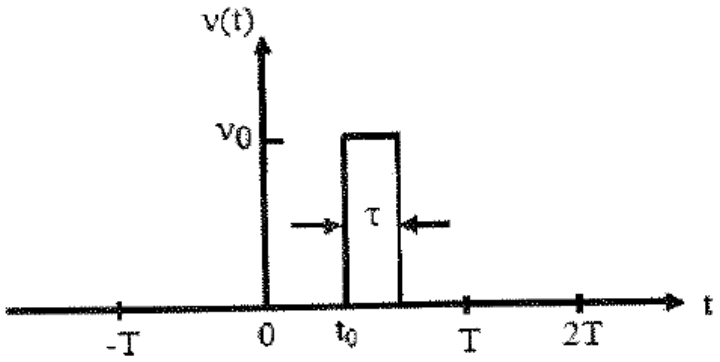
i) Δ-connected load at a lagging PF of 0.8; then find the phase impedance.

ii) Y-connected load at a lagging PF of 0.8; then find the phase impedance.

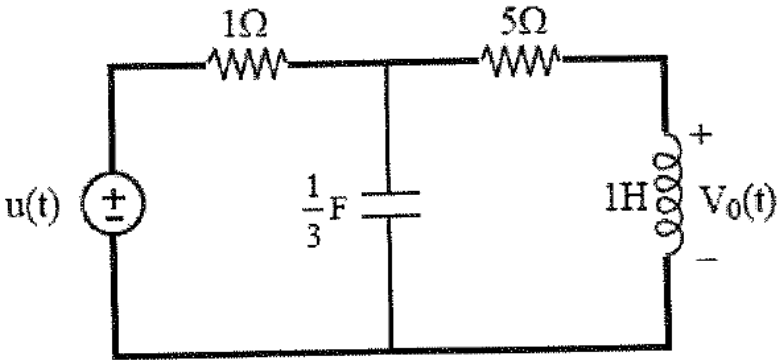
OR

4. a) Explain even symmetry odd symmetry and half wave symmetry. Also elaborate their effects on Fourier series coefficients. **8**

b) Use the Fourier transform to obtain the continuous spectrum of the single rectangular pulse Fig. **8**



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

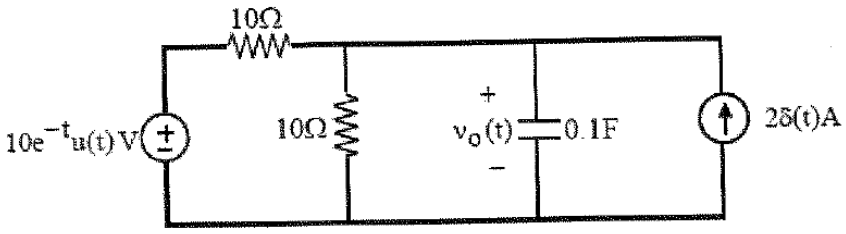


b) Find the Laplace transform of the following functions: **8**

a) $t\cos tu(t)$ b) $e^{-t}t\sin tu(t)$ c) $\frac{\sin\beta t}{t}u(t)$

OR

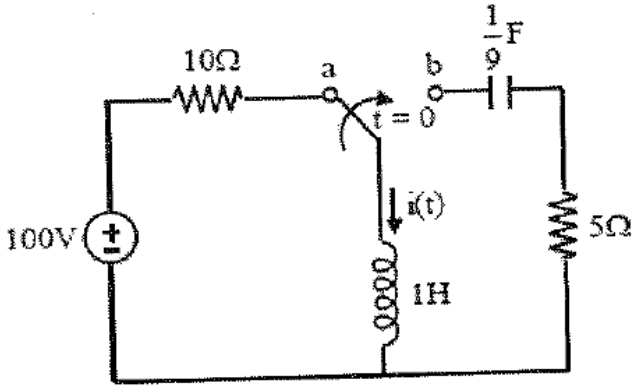
6. a) Find $v_o(t)$ in the circuit of Fig Assume $v_o(0)=5V$. **8**



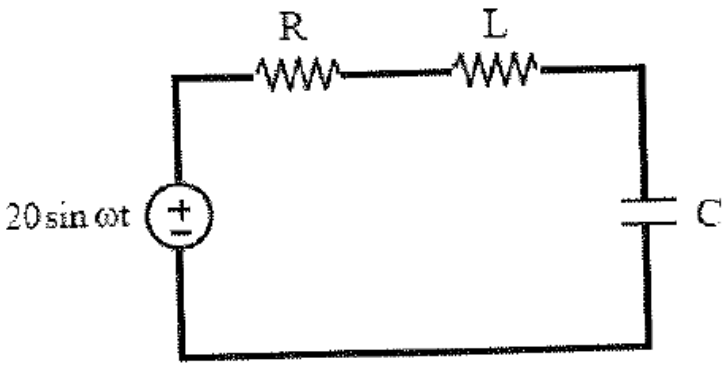
b) Find the inverse Laplace transform of **8**

a) $F_1(s) = \dfrac{6s^2 + 8s + 3}{s\left(s^2 + 2s + 5\right)}$ b) $F_2(s) = \dfrac{s^2 + 5s + 6}{(s+1)^2(s+4)}$

7. a) The circuit in fig. has reached steady state at t = 0. If the make before-break switch moves to position b at t = 0, calculate i(t) for t > 0. **8**



b) 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**



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

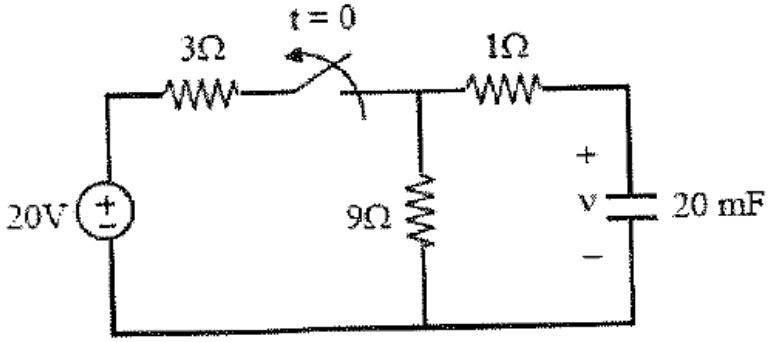
b) The inductance

c) The resonant frequency

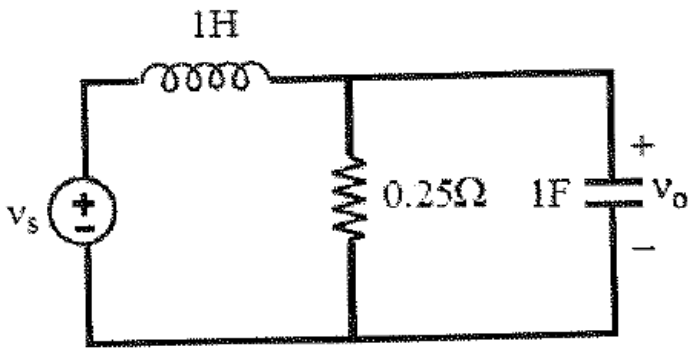
d) The bandwidth

e) The quality factor

b) The switch in the circuit in Fig. has been closed for a long time, and it is opened at t = 0. Find $v_o(t)$ for $t \geq 0$. Calculate the initial energy stored in the capacitor. **8**



9. a) Find the transfer function V_0 / V_s of the circuit in Fig. Show that the circuit is a low pass filter. **8**

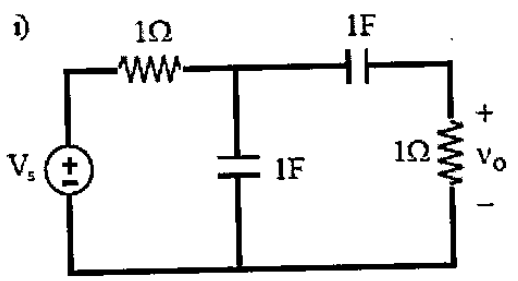


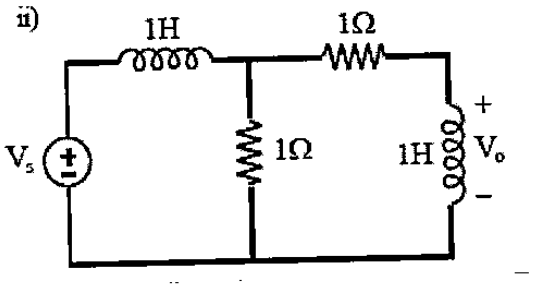
b) Show that for a band stop filter, $H(s) = \dfrac{s^2 + {\omega_0}^2}{s^2 + sB + {\omega_0}^2}, s = j\omega$ **8**

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

OR

10. a) Determine the center frequency and bandwidth of the band pass filters in Fig. **8**





b) Determine the range of frequencies that will be passed by a series RLC band pass filter with $R = 10\Omega$, $L = 25m$ H and $C = 0.4\mu F$. Find the quality factor. **8**

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