B.E. (Electronics Engineering / Electronics Telecommunication Engineering / Electronics Communication Engineering) Third Semester (C.B.S.)

Network Analysis & Synthesis

P. Pages : 5 **NRJ/KW/17/4356/4361**

Time : Three Hours * 0 5 0 3 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data wherever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Write the equilibrium equations in matrix form on MESH BASIS for the network shown in fig. 1(a). **7**

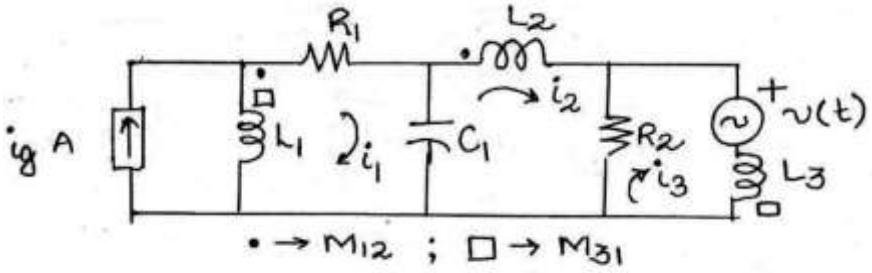

Fig. 1(a)

b) Convert the circuit shown in fig. 1(b) into a single voltage source. **6**

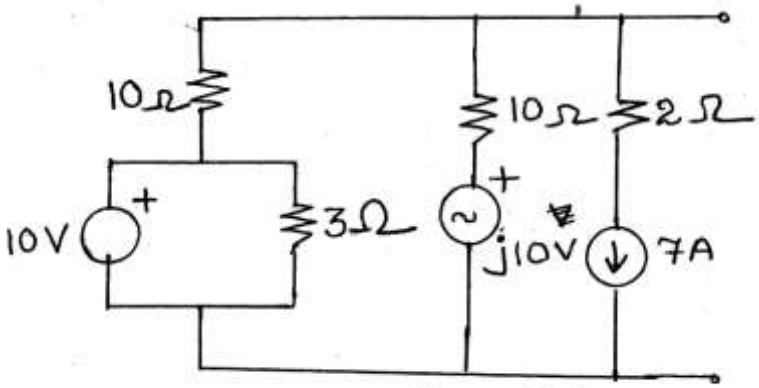

Fig 1.(b)

OR

2. a) Determine current 'I' using NODAL ANALYSIS of the network shown in fig. 2 (a). **7**

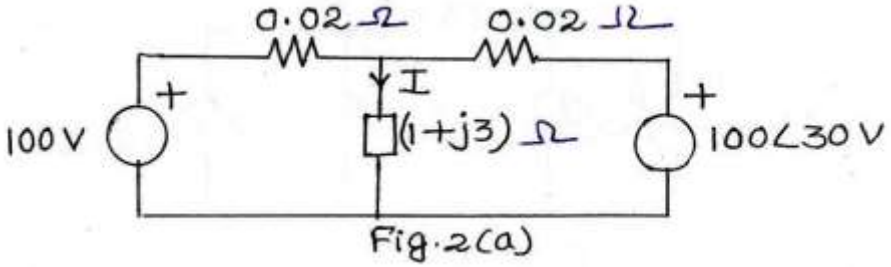

Fig. 2(a)

b) Construct the DUAL for the network shown in fig. 2(b). **6**

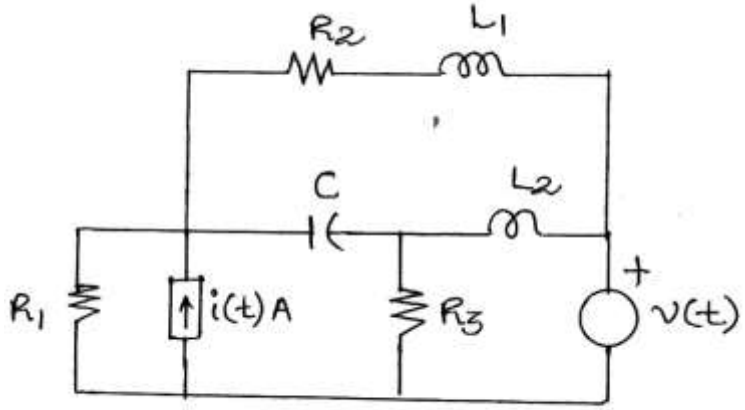

Fig. 2(b)

3. a) Find I_{AB} shown in Fig. 3(a) by 'SUPERPOSITION THEOREM'. **7**

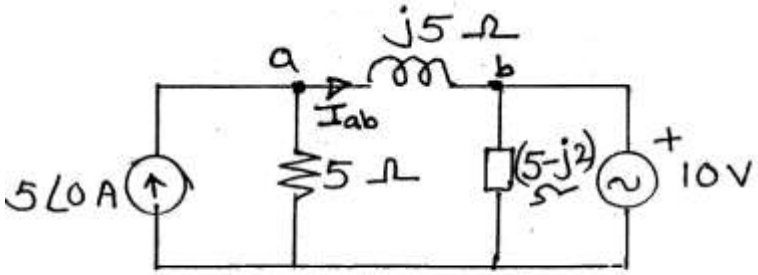

Fig. 3(a)

b) Find 'NORTON's EQUIVALENT NETWORK' across the terminals a and b of the network shown in fig. 3 (b) **7**

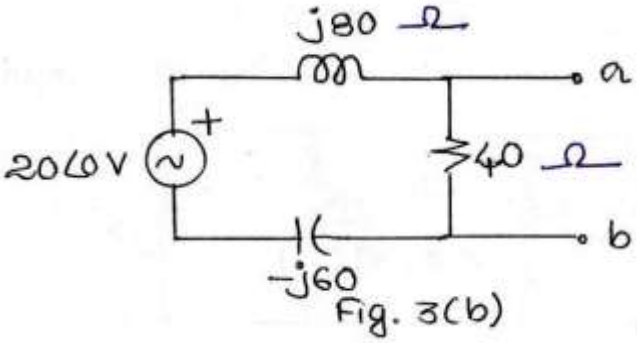

Fig. 3(b)

OR

4. a) For the network shown in fig. 4 (a), find change in current 'I' by 'COMPENSATION THEOREM, if $j5\Omega$ increases to $j8\Omega$. **8**

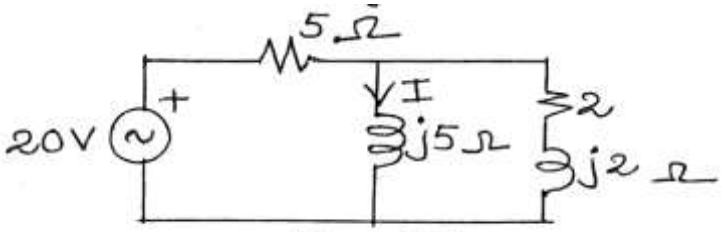

Fig. 4(a)

b) For the network shown in fig. 4 (b) find the impedance to be connected across A and B for the maximum power. **6**

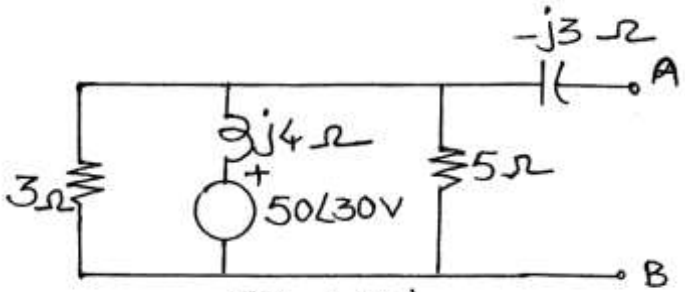

Fig. 4(b)

5. a) For R.L.C. series circuit derive the expression for the resonant frequency and show the variation of R, X_L, X_C, $(X_L - X_C)$, Z and I on the same graph. **7**

b) Compare series and parallel resonance in a.c. circuit. **6**

OR

6. a) A 24 μF capacitor is connected in series with a coil whose is 5 mH. Determine : **7**

i) Resonant frequency
ii) Resistance of the coil if 40 V voltage source operating at resonance frequency causes a circuit current of 3.6 mA.
iii) Quality factor of the coil.
iv) Bandwidth and selectivity.

b) Derive the condition for resonance in R.L.C. parallel circuit and plot Z Vs F graph showing the resonant frequency. **6**

7. a) Design a constant - K band pass filter with cut-off frequencies 2 kHz and 5 kHz and nominal characteristics impedance of 600Ω. **8**

b) Explain band stop and low pass filters. **6**

OR

8. a) The circuit shown in fig. 8 (a) is LOW PASS FILTER for this filter - **8**

i) Show that cut-off frequency, $f_c = \frac{1}{2\pi RC}$ for the condition $v_{out} = \frac{1}{\sqrt{2}} v_{in}$.

ii) Design a low pass filter with $f_c = 800\,Hz$.

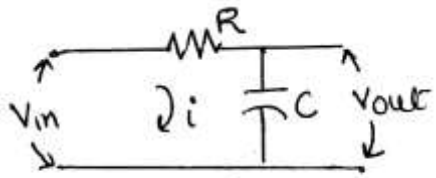

Fig. 8(a)

b) Design a symmetrical π-attenuator to give 20-db attenuation and having characteristics impedance of 100Ω. **6**

9. a) Find the current '$i_2(t)$' in the inductor L_2 after switch - k is closed at t = 0 using LAPLACE TRNAFORM for the network shown in fig. 9(a). **7**

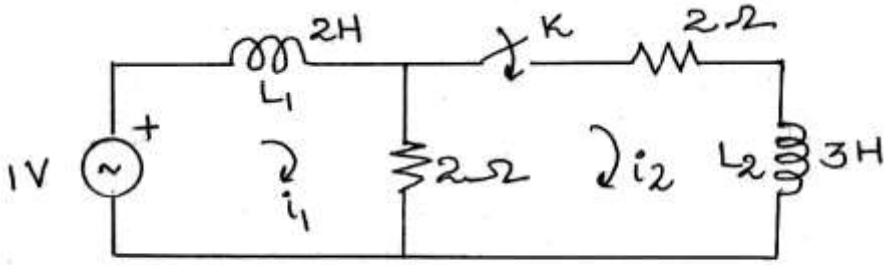

Fig. 9(a)

b) Find the voltage across the capacitor for the network shown in fig. 9 (b) by LAPLACE TRANSFORM. Assume the initial voltage across the capacitor is 2V. At t = 0, switch -k is closed. **6**

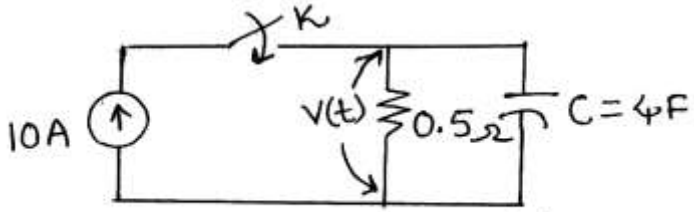

Fig. 9(b)

OR

10. a) Find 'i(t)' for the network shown in 'fig. 10(a)' if switch - k is in position-A till steady state is reached and is shifted to position - B at t = 0. **7**

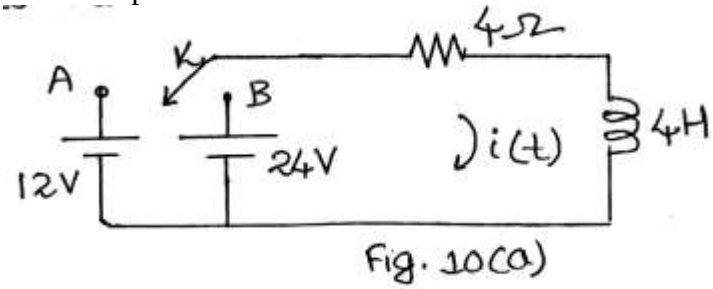

Fig. 10(a)

b) Find 'v(t)' for the periodic waveform shown in 'fig 10(b)'. **6**

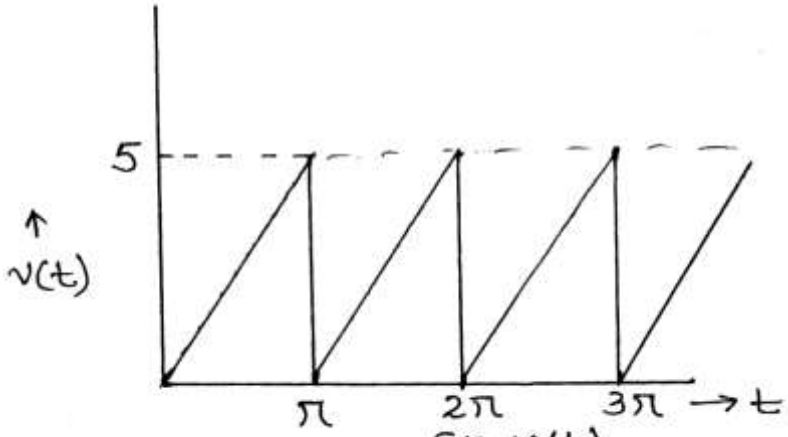

Fig. 10(b)

11. a) Find voltage transfer function, $G_{12}(s) = \frac{V_2(s)}{V_1(s)}$ for the network shown in fig. 11 (a). **7**

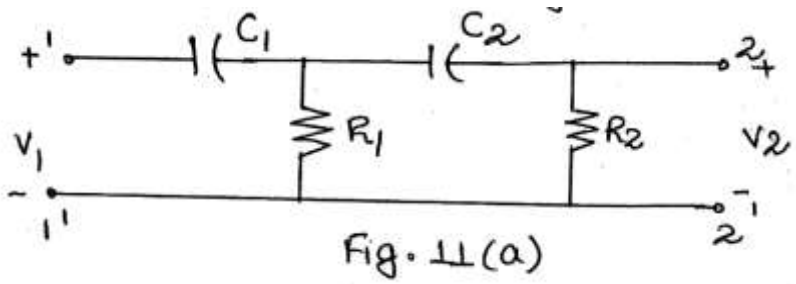

Fig. 11(a)

b) Draw 'POLE-ZERO' diagram of the given function and find i(t) from the 'POLE-ZERO' diagram. **6**

$$I(S) = \frac{10S}{(S+1)(S^2+2S+4)}$$

OR

12. a) Find short circuit parameters for the network shown in fig. 12 (a). **7**

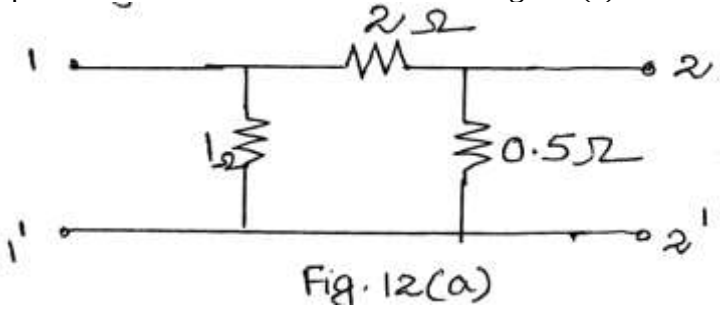

Fig. 12(a)

b) Derive reciprocity condition in terms of transmission parameters. **6**

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