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

Network Analysis & Synthesis Paper - V

P. Pages : 6 **KNT/KW/16/7216/7221**

Time : Three Hours * 0 9 0 4 * 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 whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Find the voltage across capacitor as shown in 'fig. 1(a)' using 'MESH ANALYSIS'. **7**

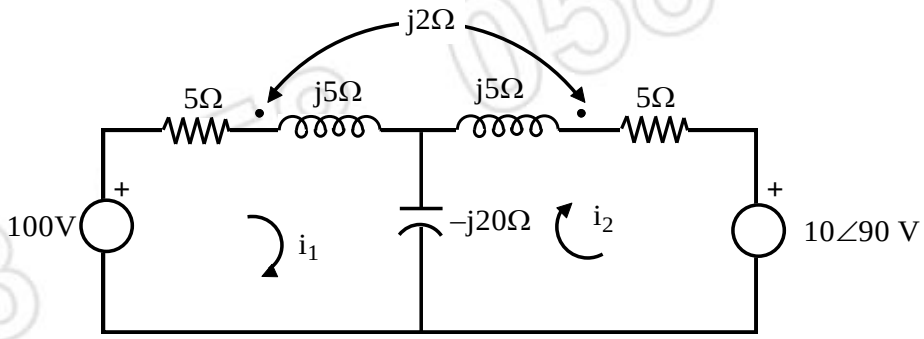

Fig. 1(a)

b) Find i_1, i_2 and i_3 as shown in 'fig. 1(b)'. Also find power consumed in 2Ω. **6**

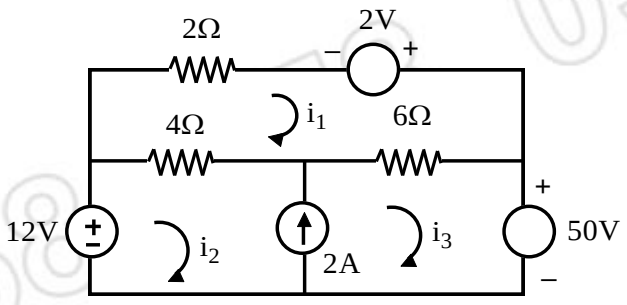

Fig. 1(b)

OR

2. a) Determine the current through inductor shown in 'fig. 2(a)' using 'NODAL ANALYSIS'. Select the reference as shown in 'fig. 2(a)'. **7**

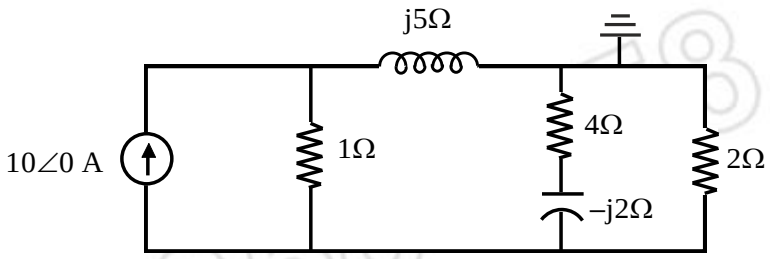

Fig. 2(a)

b) Define Quality. Draw the dual of the network shown in 'fig. 2(b)'. **6**

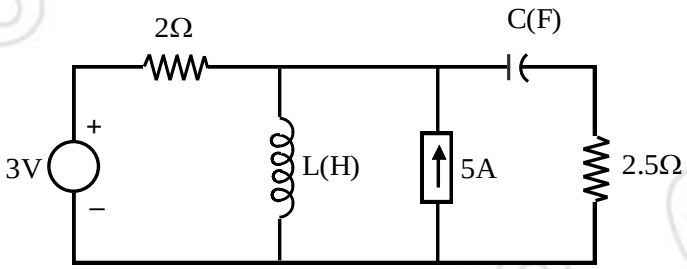

Fig. 2(b)

3. a) A loudspeaker is connected across terminals x and y of the network shown in 'fig. 3(a)'. Find : **7**

i) the impedance of the loudspeaker to obtain the maximum power transfer to the load.

ii) the value of maximum power.

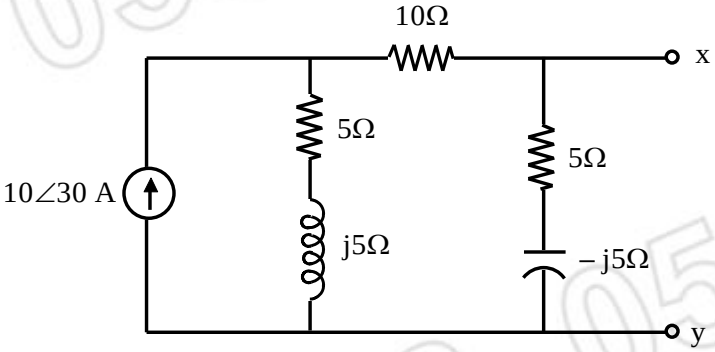

Fig. 3(a)

b) Find current 'I' in the network of 'fig. 3(b)' by 'SUPERPOSITION THEOREM'. Given : wL = 1 and wC = 1. **7**

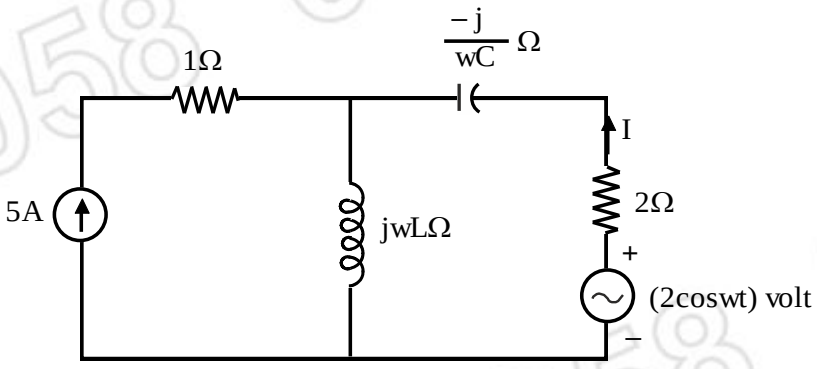

Fig. 3(b)

OR

4. a) In the network shown in 'fig. 4(a)', 5 Ω is changed to 7Ω. Find the change in current in j5 impedance using 'COMPENSATION THEOREM'. **7**

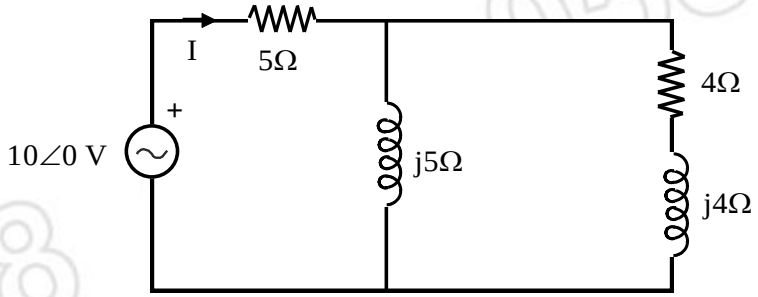

Fig. 4(a)

b) Find the voltage 'V' in the network shown in 'fig. 4(b)'. Verify 'RECIPROCITY THEOREM' by interchanging current source and resulting voltage 'V'. **7**

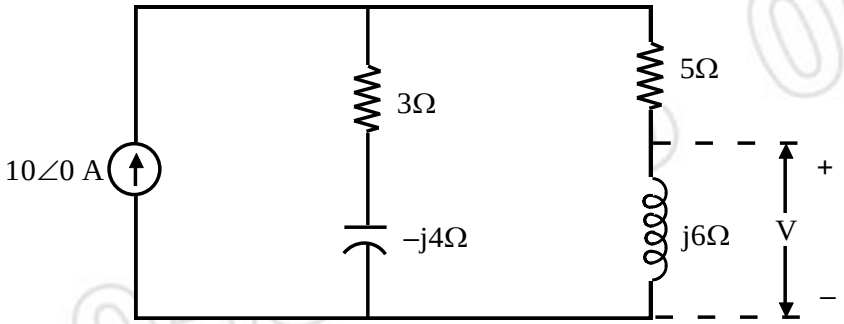

Fig. 4(b)

5. a) A series RLC circuit has R = 10 Ω, L = 0.1 H and C = 8 uF. Determine – **7**

i) the resonant frequency,
ii) Q-factor of the circuit at resonance,
iii) the half power frequencies.

b) Derive an expression for the resonant frequency of a parallel circuit, one branch consisting of a coil of inductance L Henry and resistance of RΩ and other branch of capacitor C-Farad. **6**

OR

6. a) Series RLC circuit is resonate at 1 Mega cycles/sec. Its bandwidth is 5000 cycles/sec and impedance at resonance is 50Ω. Find the values of R, L and C. **7**

b) A series RLC network is excited by a variable frequency sinusoidal voltage source. **6**

i) Draw phasor diagram when current is maximum,
ii) Draw the variation of total impedance (z), X_L, X_C, total reactance (X) and total current I with respect to frequency. Mark resonance frequency.

7. a) Design – **7**

i) a π-type attenuator and
ii) a bridged T-attenuator with the following specifications :
Attenuation = 20 dB and characteristic resistance = 500Ω.

b) The circuit shown in 'fig. 7(b)' is 'LOW PASS FILTER'. **6**

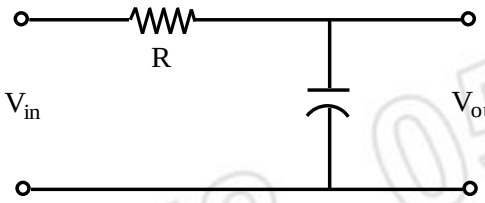

Fig. 7(b)

i) Using KVL, show that $V_{out} = V_{in} \frac{X_c}{\left(R^2 + X_c^2\right)^{1/2}}$.

ii) At cut-off frequency, if $V_{in} = \sqrt{2}\, V_{out}$, show that $f_c = \frac{1}{2\pi RC}$.

iii) Design a LOW PASS FILTER with f_c = 800 Hz.

OR

8. a) Design a 'BAND STOP FILTER' having cutoff frequencies 1-kHz and 5-kHz with nominal characteristics impedance of 700Ω. **7**

b) Explain different types of transmission line. **6**

9. a) At t = 0, the switch-K is closed connecting a voltage source ν = ($V_m$sinwt) volt to a series R-L circuit as shown in 'fig. 9(a)'. By the method of 'LAPLACE TRANSFORMATION', find i(t). **7**

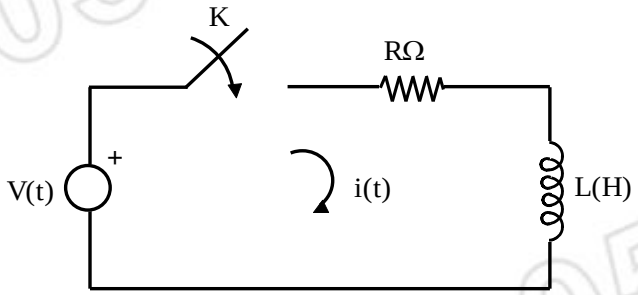

Fig. 9(a)

b) The waveform shown in 'fig. 9(b)' is non-recurring in nature. Write an equation in time domain and find the Laplace transform. **7**

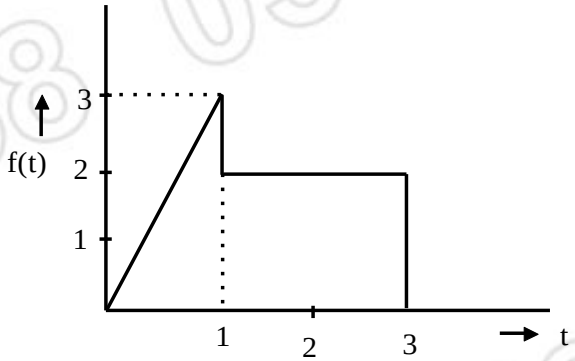

Fig. 9(b)

OR

10. a) In the network shown in 'fig. 10(a)', switch-K is assumed to be closed for a long time before it is opened at t = 0. Determine current i(t) for t > 0. **7**

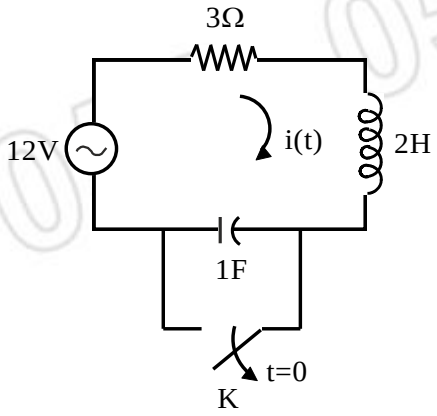

Fig. 10(a)

b) In the network shown in 'fig. 10(b)', the switch-K is moved from position-a to position-b at t = 0. (A steady state existing in position-a before t = 0). Solve for current '$i_L(t)$'. **7**

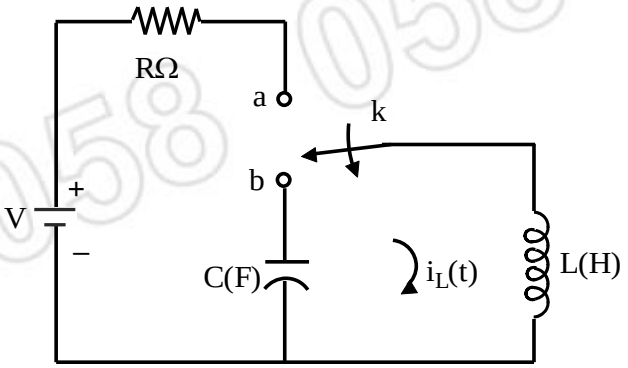

Fig. 10(b)

11. a) If $F(s) = \dfrac{s(s+1)}{(s+4)\left(s^2+4s+8\right)}$ **7**

find f(t) using 'POLE-ZERO DIAGRAM' of the function.

b) Determine $\dfrac{V_2(s)}{V_1(s)}$ for the circuit shown in 'fig. 11(b)'. **6**

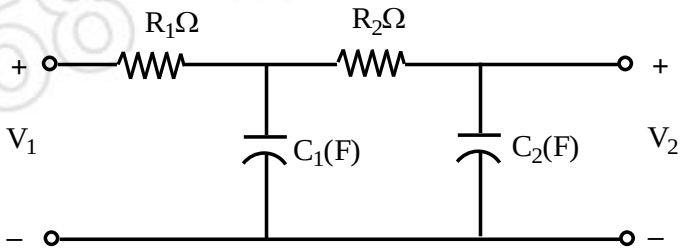

Fig.11(b)

OR

12. a) If the z-parameter matrix of a network is given as – **4**

$$\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$$

find transmission parameters of the network.

b) Determine the open circuit parameters of the network shown in 'fig.12(b)'. Check the reciprocity of the network. **5**

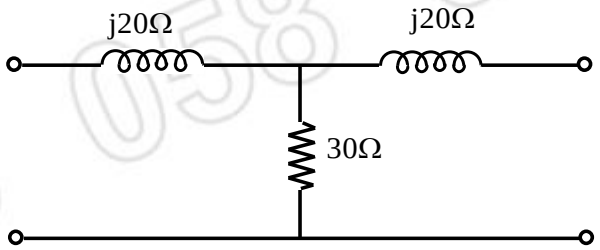

Fig.12(b)

c) Derive the reciprocity condition for h-parameter. **4**

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