Faculty of Engineering & Technology
Third Semester B.E. (Electronics Engg./ET/EC)
(C.B.S.) Examination
NETWORK ANALYSIS AND SYNTHESIS

Time—Three Hours] [Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Assume suitable data wherever necessary.

(3) Illustrate your answers wherever necessary with the help of neat sketches.

(4) Use of Non-Programmable calculator is permitted.

1. (a) Find the current J_1 and J_2 due to d.c. source in the network shown below in 'Fig. 1(a)'.

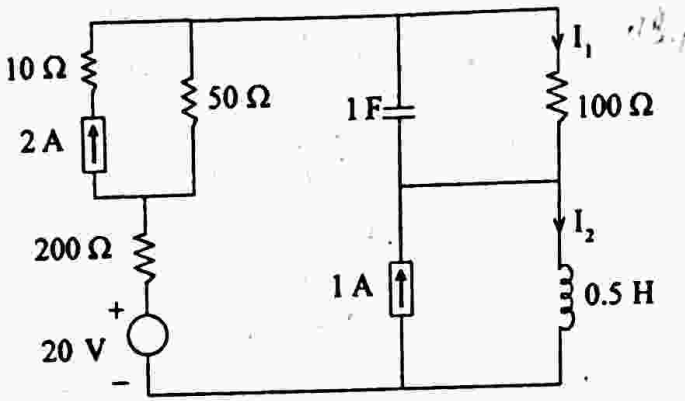

Fig. 1(a)

6

(b) Write the set of independent mesh equations for the network shown below in Fig. 1(b) :

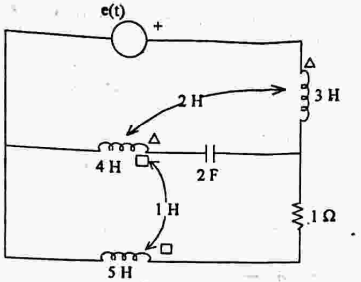

Fig. 1 (b) 7

OR

2. (a) In the network shown in 'Fig. 2(a)', determine the voltage $\bar{V}_b$ which results in zero current through $(2 + j3)\ \Omega$ impedance. Use Nodal analysis.

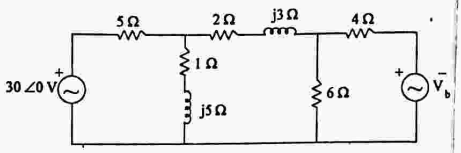

Fig. 2 (a) 7

(b) Define duality. What are the conditions for duality ? Obtain the dual of the network shown in 'Fig. 2 (b)'.

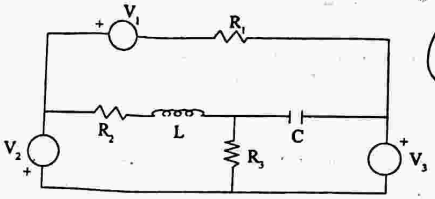

Fig. 2 (b) 6

3. (a) What should be the value of 'Z_L', connected across A and B in 'fig. 3(a)' so that it will draw the maximum power. Also calculate the maximum power.

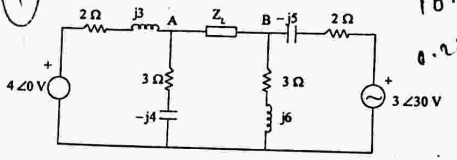

Fig. 3 (a) 7

(b) In the network shown in 'Fig. 3(b)', if resistance 'R_1' is decreased by 10%, find the change in current

'I' by using compensation theorem.

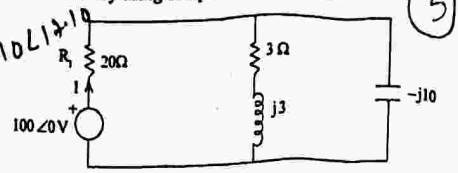

Fig. 3 (b) 7

OR

4. (a) In the network shown in 'Fig. 4(a)' find 'I' and verify reciprocity theorem.

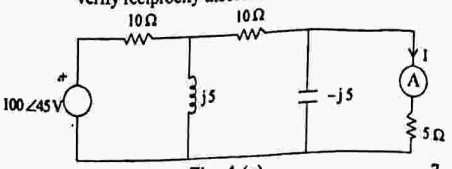

Fig. 4 (a) 7

(b) Obtain Thevenin's and Nortan's equivalent across the terminals A and B of the network shown in 'Fig. 4(b)'.

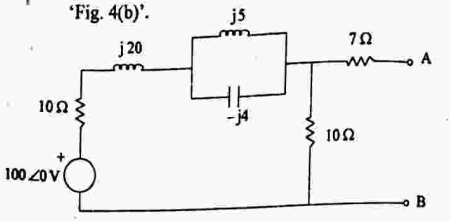

Fig. 4 (b) 7

5. (a) For R-L-C series circuit derive the expression for 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) Series RLC circuit is resonant at 1 Mega Cycles/sec. Its bandwidth is 5000 cycles/sec. and impedance at resonance is 50 Ω. Determine the values of R, L and C. 6

OR

6. (a) Compare series and parallel resonance in A.C. circuit. 6

(b) Explain the meaning of half power frequencies for series RLC circuit. Also calculate the half power frequencies, resonant frequency, bandwidth and Q-factor for RLC series circuit with R = 0.2 Ω, L = 100 mH, and C = 50 μF. 7

7. (a) Design constant K low pass 'T' and 'π' sections of filter having cut-off frequency 3000 Hz and nominal characteristic impedance of 600 Ω. Also find the frequency at which filter offers attenuation of 16 db. 7

(b) Explain the meaning of band pass and band stop filter. Also design a prototype band pass filter having cut-off frequency of 2000 Hz and 5000 Hz. The nominal characteristic impedance is 600 Ω. 7

OR

8. (a) Draw the equivalent circuit of transmission line and write the equations for voltage and current. 7

(b) Explain the design procedure for high pass filters. 7

9. (a) Find the continuous solution for $I_1(t)$ and $I_2(t)$ of Fig. 9(a), if the switch 'K' is closed at t = 0. Assume the networks to be initially relaxed.

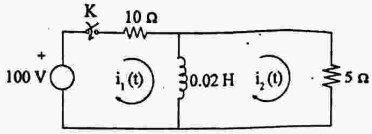

Fig. 9 (a) 7

(b) Synthesize the waveform of 'Fig. 9(b)' and obtain its Laplace Transform :

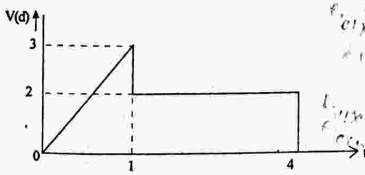

Fig. 9 (b) 6

OR

10. (a) Find the Laplace transform of periodic waveform shown in Fig. 10(a).

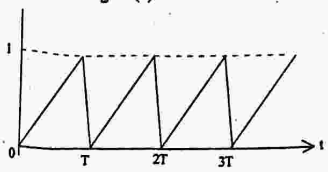

Fig. 10 (a) 6

(b) Find the particular solution for the current i(t), of Fig. 10 (b), when the switch is moved from 'x' to 'y' at time t = 0; steady state is being previously established in the circuit.

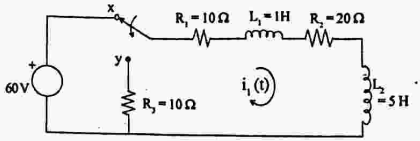

Fig. 10 (b) 7

11. (a) Express Z-parameters in terms of :

(i) ABCD parameters

(ii) h-parameters. 6

(b) For the network shown 'Fig. 11(b)', find $Y_{12}(S)$ and plot its poles and zeros.

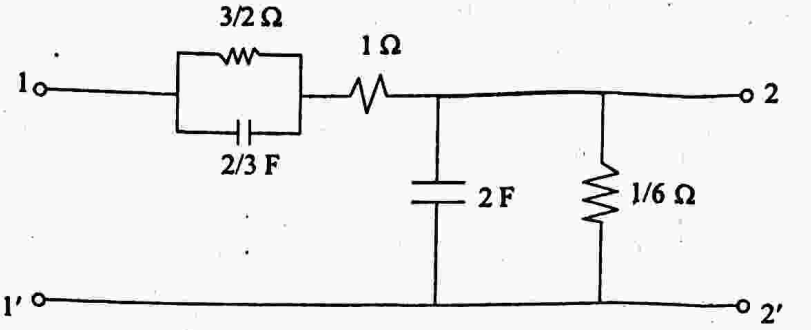

Fig. 11(b) 7

OR

12. (a) Define ABCD parameters and obtain the condition for reciprocity in terms of ABCD parameters. 7

(b) Find the voltage transfer function $G_{12}(S)$ for the network shown in Fig. '12(b)'.

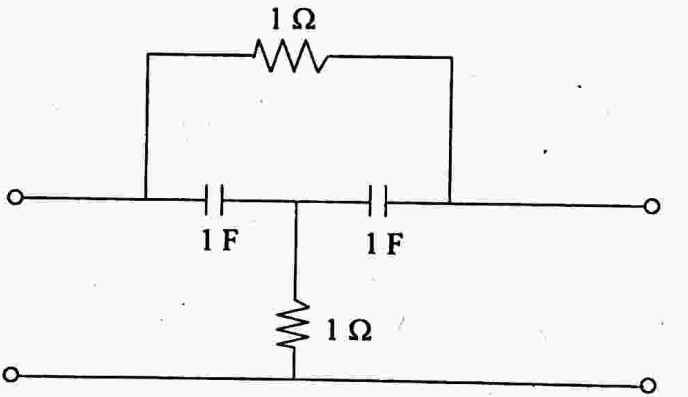

Fig. 12(b) 6