Code No: NR10204 **NR**

I B.Tech Supplementary Examinations, November/December 2005
NETWORK THEORY
(Common to Electrical & Electronic Engineering,Electronics & Communication Engineering,Computer Science & Engineering,Electronics & Instrumentation Engineering,Bio-Medical Engineering,Information Technology,Electronics & Control Engineering,Computer Science & Systems Engineering,Electronics & Telematics and Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Distinguish between active and Passive elements with suitable examples.
   (b) Explain about the dot conventions in coupled circuits.
   (c) Two magnetically coupled coils are connected in series and their total effective inductance is found to be 4.4mH. When one coil is reversed is convection, the combined inductance drops to 1.6mH. Find the self inductances, mutual inductance between the coils if the coefficient of coupling is 0.6325. [4+4+8]

2. (a) A RLC series circuit consists of resistance 75 ohms, inductance 125mH and capacitance of 200 μF. The circuit is excited by a sinusoidal voltage of 115V, 50Hz, 1-ϕ source. Determine the current, voltage across each element, power consumed in each element. Draw the phasor diagram.
   (b) Determine the possible values of capacitance in a branch consisting of 4Ω resistance in series with it. This branch is connected in parallel with a series circuit consisting of resistance of resistance of 4 ohms and inductance of 5 mH. Find the values of C such that circuit will resonate at ω = 2000 rad/sec. [8+8]

3. (a) An unbalanced 4 wire star connected load has a balanced supply of 400V. The load impedances are Z_{AN} = 4 + j 8 ohms, Z_{BN} = 3 + j 4 ohms, Z_{CN} = 15 + j 10 ohms. Calculate the line currents, neutral current and total power.
   (b) Three equal star connected impedances are connected across a 400V, 3-ϕ, 50Hz supply. Calculate the line currents, if power consumed in the circuit is 5 kw at 0.7 p.f. lagging. [8+8]

4. (a) Define basic cutset and basic loop incidence matrices and write these for the following graph by taking 1,2,3 as three branches as shown in Figure 1.
   (b) Draw the Dual of the following network Figure 2.
   (c) Write the loop equations in matrix form for the following circuit shown in figure 3: [4+4+4+4]

5. (a) Find the maximum power that can be tranferred to the load resistance R_L in the circuit shown in figure. 4.

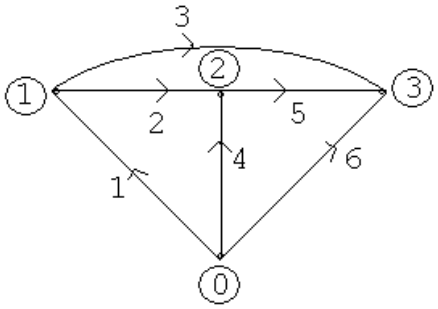

Figure 1:

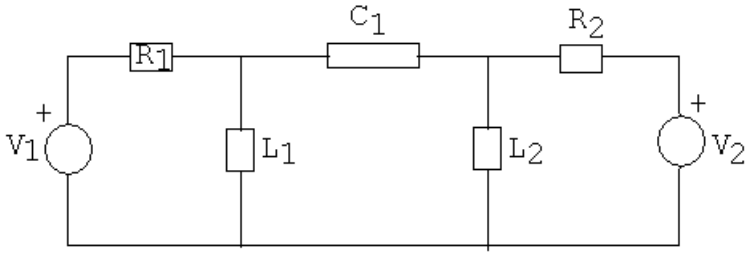

Figure 2:

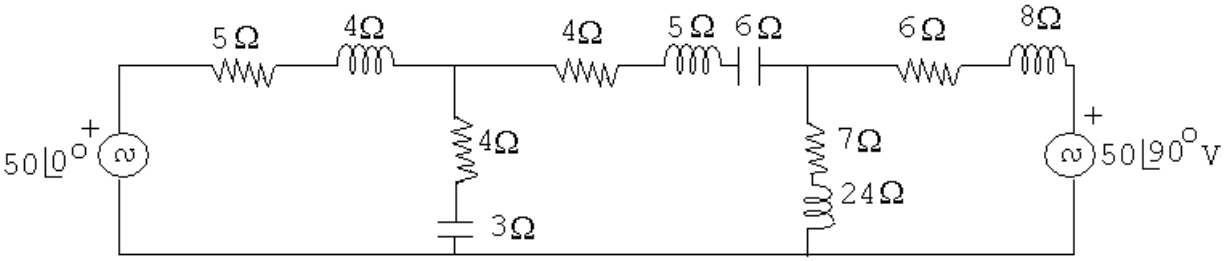

Figure 3:

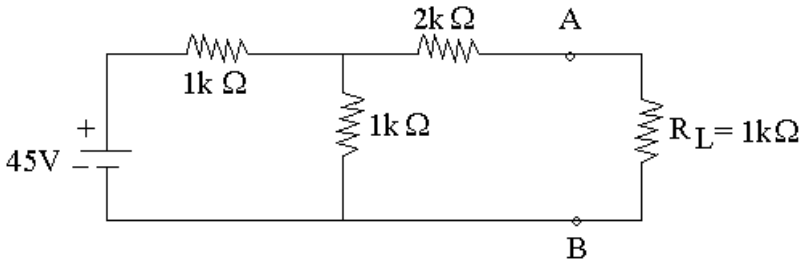

Figure 4:

(b) State Tellegens's theorem and explain.

(c) State whether the following circuit shown in figure 5 is reciprocal or not ?

[6+4+6]

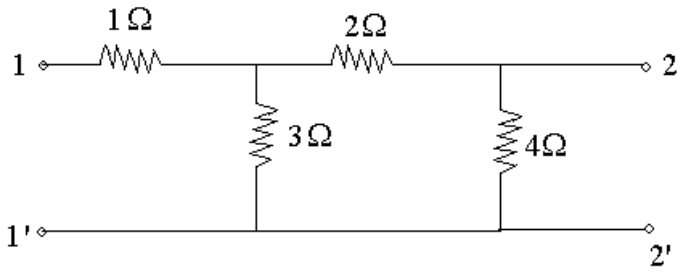

Figure 5:

6. (a) Obtain the transmission parameters of the following 2-port network Figure 6.

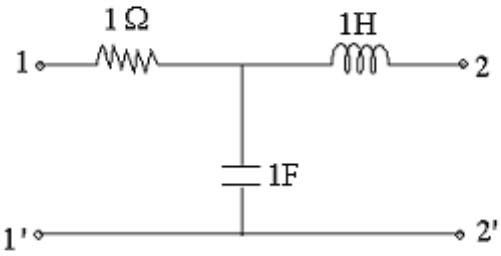

Figure 6:

(b) Obtain the hybrid parameters of the following 2-port network Figure 7.[8+8]

7. (a) Find the expression for current of a series R-L-C circuit fed by constant d.c. voltage of 20V with R = 4 Ω, L = 1 H and $C = \frac{1}{4}F$. Assume initial conditions to be zero.

(b) Derive the expression for transient reponse of a R-L series circuit fed by e = E_m sin ωt. [8+8]

8. (a) Distinguish between Low pass and filters.

(b) Design an m-derived T section Low pass filter having a cut-off frequency of 200 Hz, design impedance of 600 ohms and infinite attenuation frequency of 2050Hz.

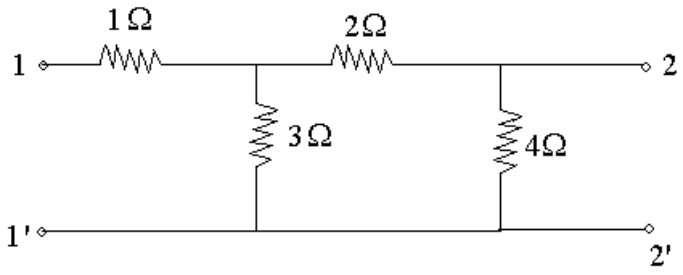

Figure 7:

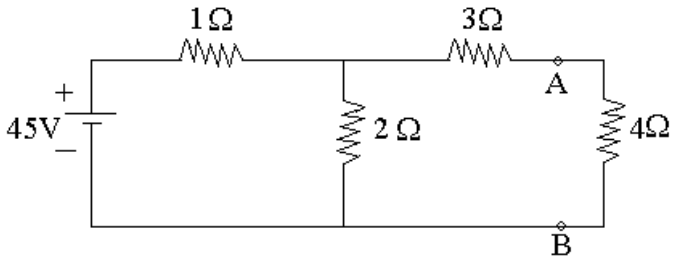

Figure 8:

(c) Write the PSPICE commands that are required to obtain voltage across R_L. figure 8.

[6+6+4]

⋆ ⋆ ⋆ ⋆ ⋆