(b) Find Thevenin's equivalent circuit at terminals a-b for circuit shown in Figure 9. (10)

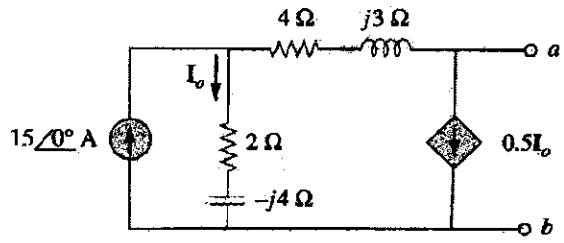

Figure 9

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1045 **C**

Unique Paper Code : 2512041102

Name of the Paper : Basic Circuit Theory

Name of the Course : **B.Sc. (H) Instrumentation**

Semester : I

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **seven** questions in all, out of which you have to attempt **five** questions. Question **1** is compulsory.
3. **All** questions carry equal marks.
4. Use of Non-Programmable Scientific Calculator is allowed.

1. (a) What is the lower cut off frequency of High Pass RC filter if R = 5K and C = 0.01uF? (3)

(b) Write the expression of current through the inductor for source free RL circuit. Also plot the current transient assuming I_0 be the initial current through inductor. (3)

(c) Define Instantaneous, Peak to Peak, Root Mean Square and Average Values of current. (3)

(d) Explain the Reciprocity Theorem with example. (3)

(e) Explain Voltage-Current relationship in Resistor, Inductor and Capacitor. (3)

(f) Explain resonance in Series RLC Circuits, Frequency Response of Series RLC Circuits and Quality (Q) Factor. (3)

2. (a) Evaluate the value of R so that the maximum power is delivered to R for the circuit shown in Figure 1. Determine the maximum power delivered to R and the power efficiency of circuit under maximum power condition. (9)

(b) Evaluate the Z-parameters for the circuit shown in Figure 8. (9)

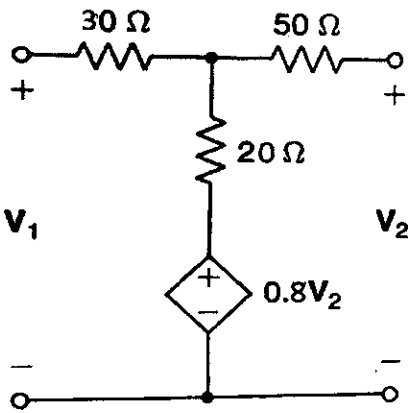

Figure 8

7. (a) In a series RLC circuit, if R=4Ω, L=25mH, C=0.625uF and peak source voltage Vs=100V then evaluate: (8)

(i) Resonant frequency (f_R)

(ii) Quality factor (Q)

(iii) Bandwidth (B)

(iv) Impedance at Resonance

5. (a) Determine the range of frequencies that will be passed by a series RLC band pass filter with R=10 Ω, L=12.5 mH and C=0.8 μF. Find the quality factor. Explain how the same combination can be used to design a series RLC band stop filter. Also, draw the frequency response for both cases. (9)

(b) Define Instantaneous power, average power, reactive power, complex power and power factor. (9)

6. (a) Find time-period, frequency, avg value, rms value, form factor and peak factor of the waveform shown below in Figure 7. Also, find the instantaneous, average and total power. (9)

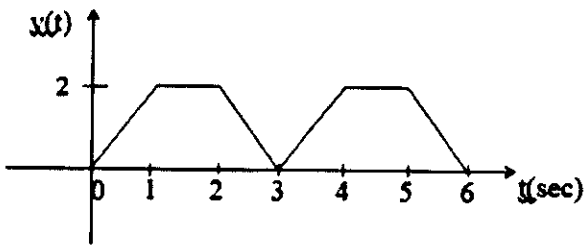

Figure 7

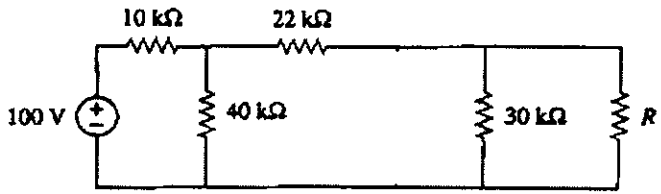

Figure 1

(b) Find the voltages at node 1 & 2 for the circuit shown in Figure 2. (9)

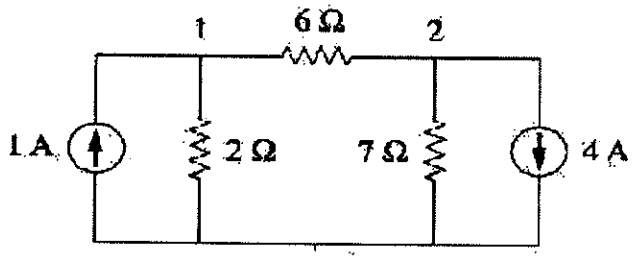

Figure 2

3. (a) Obtain the z-parameters and transmission-parameters for the circuit shown in Figure 3. (9)

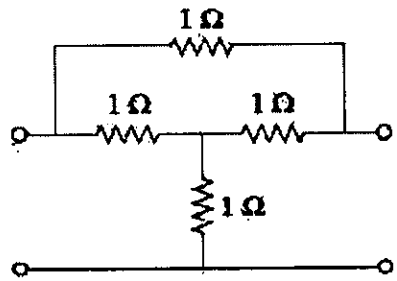

Figure 3

(b) Find the mathematical expression for the current $i_L(t)$ for the circuit shown in Figure 4 where the switch was closed at t=0s. Assume that current through inductor is zero initially. (9)

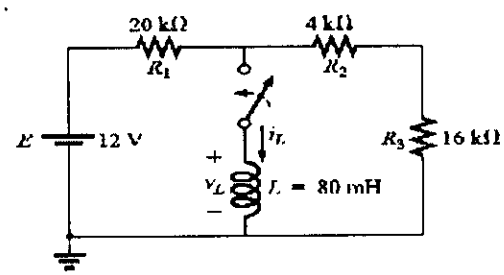

Figure 4

4. (a) Find the voltage developed across resistor 8Ω using superposition theorem for the circuit shown in Figure 5. (10)

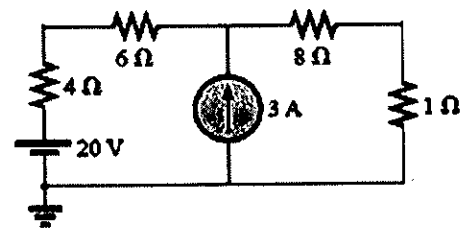

Figure 5

(b) Find the equivalent resistance seen by the voltage source using star-delta conversion for the circuit given in Figure 6 and also find the total current flowing in the circuit. (8)

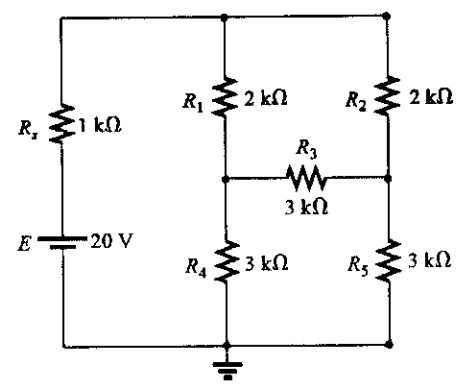

Figure 6