

Sl. No. of Question Paper: 1760

Unique Paper Code: 2511102

Name of the Paper: Circuit Analysis

Name of the Department: Instrumentation

Semester: II

Name of the Course: B. Tech. Instrumentation

Duration: 3 hours

Max. Marks: 75

Instructions for Candidates

1. Attempt any five questions in all.
2. Question No. 1 is compulsory.
3. Use of Non-Programmable Scientific Calculator is permitted.

F-3

5x3=15

Question 1)

a) Express the total impedance of the given circuit in Fig.1

1. When $X_1 = C_1, X_2 = C_2, X_3 = C_3$
2. When $X_1 = L_1, X_2 = L_2, X_3 = L_3$
3. When $X_1 = R_1, X_2 = R_2, X_3 = R_3$

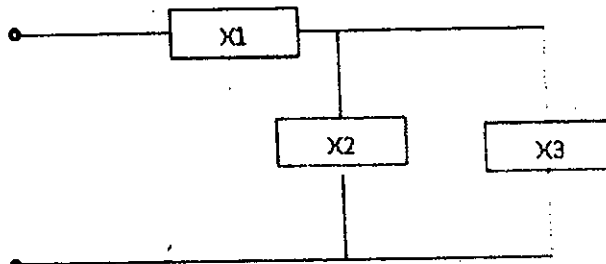


Fig 1

b) Find voltage across $10\ \Omega$ resistor in Fig.2 if control current i_x in the dependent source is

1. 2A
2. -1A

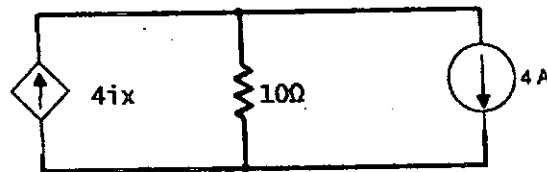


Fig 2

c) If applied voltage is sinusoidal function of time $V = V_m \sin \omega t$. Then plot voltage and current signal on same scale for

1. Pure R
2. Pure L
3. Pure C

d) Calculate the frequency at which the current leads the voltage by 45° in the series RC circuit. $R=10\ \Omega$ and $C=50\ \mu\text{F}$. Plot the impedance diagram also.

e) What is Resonance and Resonating frequency?

Question 2

5+5+5=15

a) Calculate the current in every component of the given circuit in Fig.3 using mesh analysis.

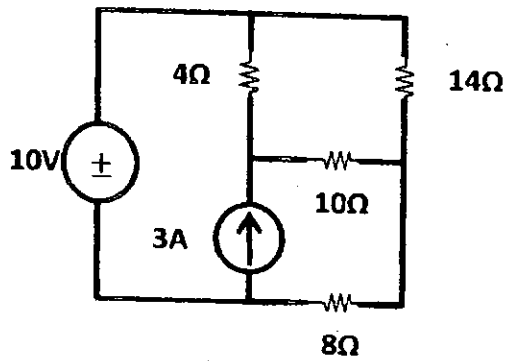


Fig 3

- b) In Fig.4 three resistors $R_1=1\ \text{ohm}$, $R_2=5\ \text{ohm}$ and $R_3=10\ \text{ohms}$ are connected in turn to terminals AB. Calculate power delivered to each resistor.

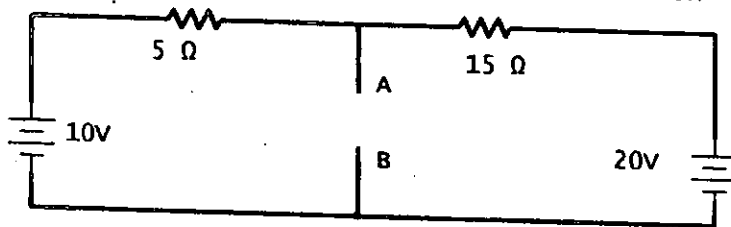


Fig 4

- c) Calculate Hybrid parameters of network shown below in Fig.5

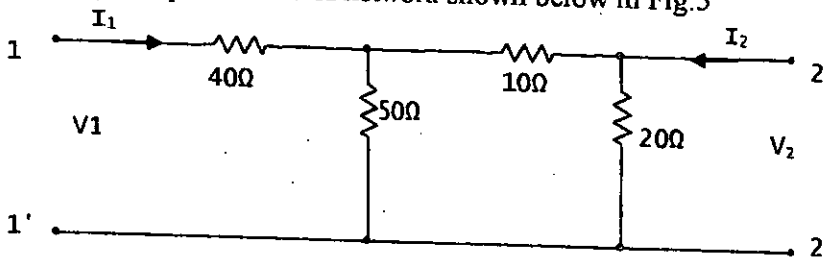


Fig 5

Question 3

5+5+5=15

- a) In a circuit shown below in Fig. 6, the switch is closed on position 1 at $t=0$ and then moved to position 2 after 1ms. Find the equation for current in both intervals and sketch the complete current transient.

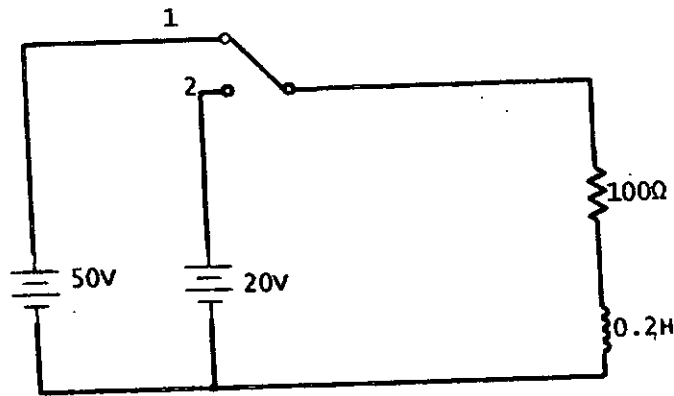


Fig 5

b) Calculate the Step and the impulse response for the RL circuit shown below in Fig. 7

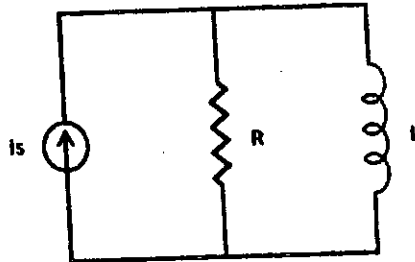


Fig 7

c) State the principle of Duality and find the dual of the given circuit.

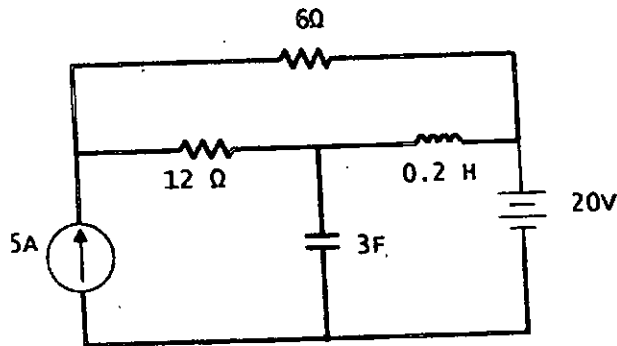


Fig 8

5+5+5=15

Question 4

a) Given node 1 and 2 in Fig.9 find voltage at node 1.

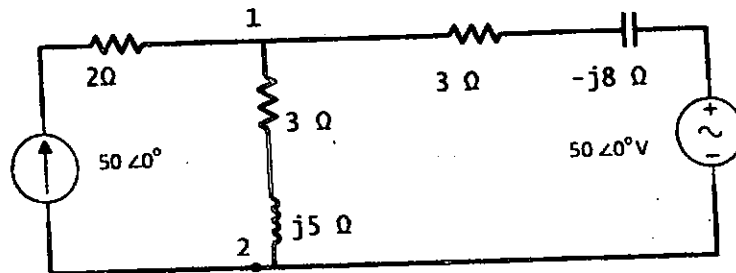


Fig 9

b) Find current through $2\ \Omega$ resistor using superposition theorem in Fig.10.

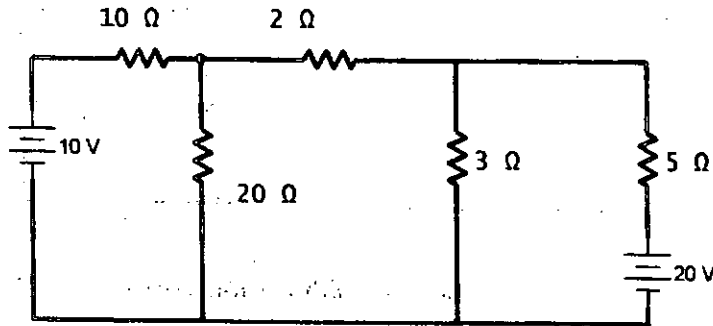


Fig 10

C
 a) In a series combination of RLC as shown in figure has voltage and current as given by $V = 353.3 \cos(3000t - 10^\circ)$ and $I = 12.5 \cos(3000t - 55^\circ)$. Calculate the values of R and C.

eye given as

Question 5

5+5+5=15

- b) Given a series RLC circuit with $R=100\ \Omega$ and $L=0.5\text{H}$ and $C=40\ \mu\text{F}$. Calculate Resonant frequency and lower and upper half power frequency.
- c) What is power triangle? Calculate it for an RL circuit with $R=60\ \text{ohms}$ and $L=160\ \text{mH}$ and input ac voltage signal of $120\ \text{V rms}$, $60\ \text{Hz}$.
- d) Find the voltage across each element in Fig.11 using mesh analysis.

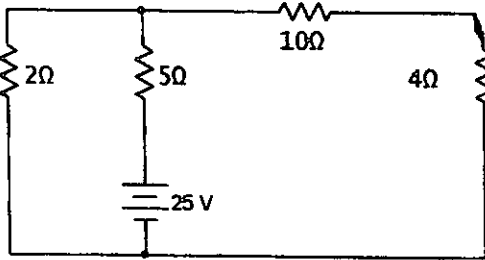


Fig 11

Question 6

5+5+5=15

a) Determine Delta connected equivalent circuit for the Star connected impedance in the circuit of Fig.12

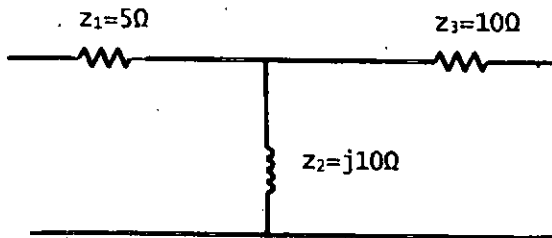


Fig 12

- b) In the single source network shown in Fig.13 the voltage source causes a current I_x in 5 ohm branch. Find I_x and verify reciprocity theorem for this circuit.

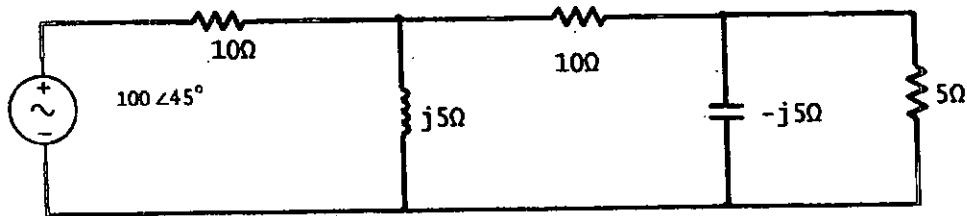


Fig 13

- c) Find L in the high pass filter if $H_v(\omega) = 0.50$ at a frequency of 50 MHz Also find at what frequency is $H_v(\omega) = 0.90$.

Question 7

5+5+5=15

- 1) Find the average and effective values of half wave rectified sine wave.
- 2) Calculate the Resonant frequency, bandwidth and the Q factor of the series LCR circuit in which $R=1K\Omega$, $C=0.01\mu F$, $L=1mH$. What will be power at cut off frequency if the input voltage is $10\sin(314t)$. Plot the impedance vs frequency curve for the parallel LCR circuit.
- 3) Determine the y-parameter of the network shown in Fig.14

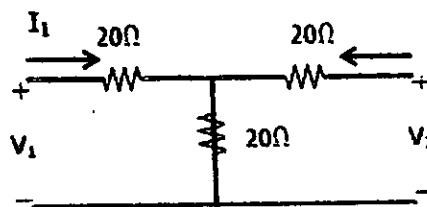


Fig 14