Code No: RT21021 **R13** SET - 1

II B. Tech I Semester Supplementary Examinations, June - 2015
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. (a) Draw the circuit diagram for measuring 3 –phase power using three Watt meter method
(b) Write the differences between balanced and unbalanced 3-phase circuits.
(c) Write the behavior of inductor and capacitor when they are suddenly connected a DC supply.
(d) Give the expressions for symmetry and reciprocity in case of hybrid parameters.
(e) What is a positive real function?
(f) Define line spectra and phase angle spectra.

(4M+4M+4M+4M+3M+3M)

PART –B

2. (a) Each phase of a balanced three phase delta connected load has a 0.5 Henry inductor in series with a parallel combination of a 7 μF capacitor and 50 Ω resistance. If a 3-phase voltage of 230 V at a frequency of 400 rad/sec is applied to this load, find i) phase current ii) line current and iii) total power absorbed by the load .
(b) Draw the phasor diagram for a balanced delta-connected supply system and establish the relation between line currents and phase currents.

3. (a) Explain how the three-phase power is measured using two-wattmeter method.
(b) A 400 V, 3-phase, balanced supply is connected to an unbalanced delta load having three impedances $Z_{AB} = 106\angle -90^0$ Ω, $Z_{BC} = 63.25\angle 71.56^0$ Ω, $Z_{CA} = 100$ Ω. Calculate line currents and power consumed if (i) the phase sequence is ABC and (ii) the phase sequence ACB.

4. (a) A series RC circuit has a sinusoidal voltage source $v(t) = V_m \sin(\omega t + \phi)$ applied at time when $\phi = 0$. Find the expression for current.
(b) A series R-L circuit with initial current I_0 in the inductor is connected to a d.c voltage V at t=0. Derive expression for the instantaneous current through the inductor for t > 0.
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5. (a) Two 2-port networks A and B are connected in parallel. Each of these networks has their own y-parameters. Show that resultant y-parameters of the combined parallel network is sum of y-parameters of the individual networks A and B.
   (b) Find the ABCD parameters of the network shown in Figure 1.

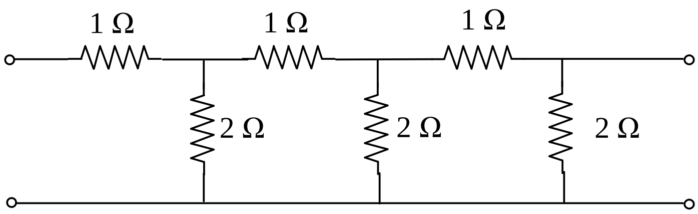

Figure 1

6. Realize foster forms of the following LC impedance function.

$$Z(s) = \frac{(s^2+1)(s^2+3)}{s(s^2+2)(s^2+4)}$$

7. In the circuit shown in Figure 2, the input voltage is a periodic signal with period 2 as shown. Determine: i) the exponential Fourier series representation of input signal ii) the trigonometric Fourier series representation of input signal iii) the exponential Fourier series representation of output signal

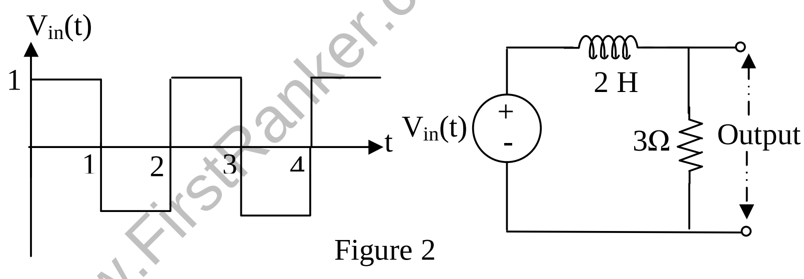

Figure 2

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PART –A

1. (a) Write the relationships between phase voltages and line voltage, phase current and line currents in delta connected 3-phase system.
(b) Given that voltage V_{cn} = 440 $\angle 30^0$ in a balanced 3-phase system. Find V_{an} and V_{bn} assuming a positive phase sequence (ABC).
(c) Write the expressions for time constant of an R-L circuit and R-C circuit.
(d) Give the expressions for symmetry and reciprocity in case of impedance parameters.
(e) List the properties of positive real function.
(f) What is the difference between Fourier integrals and Fourier transforms.
(4M+3M+4M+4M+3M+4M)

PART –B

2. (a) A star-connected load, each phase of which has an inductive reactance of 50 Ω and resistance of 15 Ω, is fed from the secondary of a three-phase, delta-connected transformer. If the transformer phase voltage is 400 V, calculate i) the potential difference across each phase of the load, ii) the load phase current, iii) the current in the transformer secondary windings, and iv) the power and power factor.
(b) Show that power consumed by three identical phase loads connected in delta is equal to three times power consumed when phase loads are connected in star.

3. An unbalanced star connected load is connected across a 3-phase, 440 V balanced supply of sequence RYB as shown in Figure 1. Two wattmeters are connected to measure the total power supplied as shown in the figure. Find the readings of the wattmeters. Draw the phasor diagram.

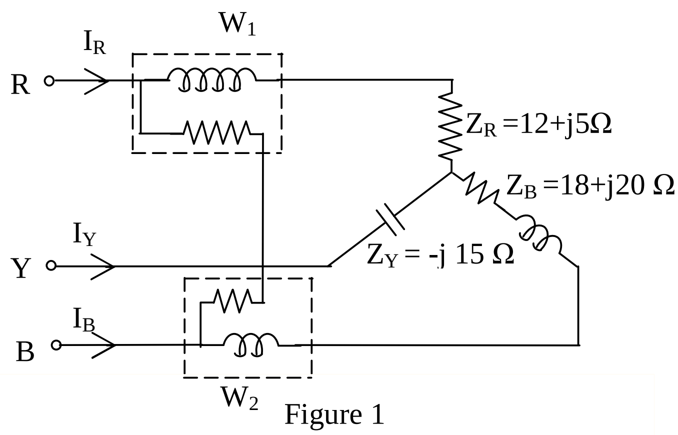

Figure 1
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4. (a) A series R-C circuit, with R=50 ohms, C=10 μF has a sinusoidal voltage of $230\sqrt{2}\sin 314t$. Find the transient response.
(b) A series R-L circuit with resistance, R=100 ohms and inductance, L= 1H has a sinusoidal voltage source 200 sin(500t + φ) applied at time when φ = 0. i) Find the expression for current ii) At what value of φ must the switch be closed so that the current directly enter steady state.

5. (a) Why Z-parameters are known as open circuit parameters and Y-parameters are known as short circuit parameters? Explain.
(b) Find Y and Z parameters of the network shown in Figure 2.

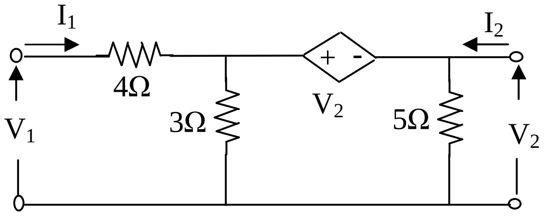

Figure 2

6. Determine the Cauer from I and Cauer form II network for the RL impedance function given below.

$$Z(s) = \frac{3(s+2)(s+5)}{(s+3)(s+6)}$$

7. Determine the voltage across the 2 Ω resistor, by the Fourier transform method, if the circuit shown in Figure 3, is excited by a current source i_S (t) = 50 cos(5t) A. Show that the result so obtained is the steady state response of the circuit.

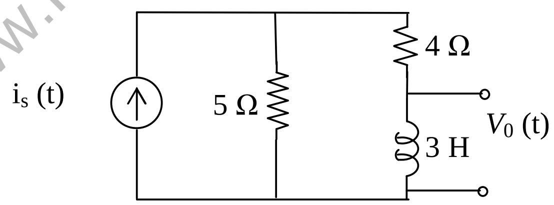

Figure 3

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2. Answer **ALL** the question in **Part-A**
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PART –A

1. a) Give the expressions for active and reactive power in a star and delta connected 3-phase system.
(b) How many wattmeters are required to measure total power in a 3-phase system? Briefly explain.
(c) What is the difference between steady state and transient response?
(d) Give the expressions for symmetry and reciprocity in case of admittance parameters.
(e) Write the properties LC immittance function.
(f) Give the expressions for Trigonometric form and exponential form of Fourier series.
(4M+4M+3M+4M+3M+4M)

PART –B

2. (a) Explain how the reactive power is measured in a 3-phase balanced system.
(b) A balanced delta connected load takes a line current of 15 A when connected to a balanced three phase 400 V system. A wattmeter with its current coil in one line and its potential coil between the two remaining lines read 2000 W. Determine the load impedance.

3. **(a)** A three phase 440 V star connected balanced supply is connected to star connected three load of $50\angle 0^0\ \Omega$, $15\angle -25^0\ \Omega$, and $25\angle 20^0\ \Omega$, Find line current, power and current in neutral of the (i) four wire system (ii) three wire system. Assume zero neutral impedance.
(b) A 3-phase star connected system with 230V between each phase and the neutral has resistances of 4Ω, 5 Ω and 6 Ω respectively in their phases. Estimate the current flowing in each phase and the neutral wire current. Find the total power absorbed.

4. (a) Determine the transient and steady state currents through a series R-C circuit when it is connected to a sinusoidal voltage source.
(b) A sinusoidal voltage $v(t) = V\sin 100\pi t$ is applied at t = 0.01 seconds to a series R-L circuit, where R=10 ohms and L=0.1 H. Calculate the ratio of maximum value of current (to which it rises) to the steady state value of current.
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5. (a) Determine the inter relation between ABCD parameters and y-parameters.
   b) Obtain the h-parameters of the network shown in Figure 1.

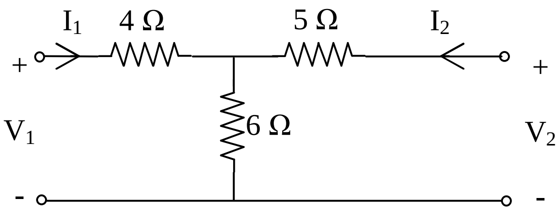

Figure 1

6. Test the given functions for positive real property

   i) $F(s) = \dfrac{5s^2+18}{s(s^2+9)}$ ii) $F(s) = \dfrac{s^2+8}{s(s^2+2)}$

   Realize the RC-impedance in Foster I forms

   $Z(s) = \dfrac{s+4}{(s+2)(s+6)}$

7. (a) Explain about the Exponential Fourier series.
   (b) Determine the Fourier transform of the rectangular function shown in Figure 2.

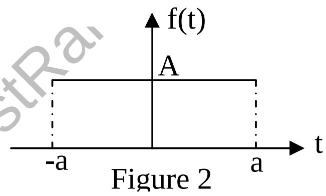

Figure 2

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PART –A

1. (a) What is a phase sequence? Write the phase sequence equations for voltages and current in delta and star connected system.
(b) Draw the connection diagram to measure reactive power in a 3-phase balanced system with one wattmeter.
(c) Write about initial conditions of L and C in a RLC series circuit.
(d) Give the expressions for symmetry and reciprocity in case of transmission parameters.
(e) What are the differences between Foster and Cauer methods?
(f) List out the properties of Fourier theorem.

(4M+4M+3M+4M+4M+3M)

PART –B

2. (a) Each phase of a balanced three phase delta: connected load has impedance of (4-j3) Ω. If a 3-phase voltage of 220 V supply is applied to this load, find the line and phase currents in the delta-connected load and the power delivered to the load.
(b) A balanced 3-phase load draws 80 kW at a lagging power factor of 0.8 from a 400 V, 3-phase, 50 Hz main. Calculate the complex power, active power, reactive power and the line current.

3. The following impedances are connected in the form of a star connected unbalanced system and it is connected to a 400 V, 3-phase supply: $Z_R = 6\angle 40^0\ \Omega$, $Z_Y = 8\angle 30^0\ \Omega$, $Z_B = 3\angle 0^0\ \Omega$. Calculate the line currents by using i) loop method and ii) Star-delta transformation technique.
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4. (a) Derive an expression for voltage across 'R' in a series R-L circuit excited by a unit step voltage. Assume zero initial conditions.
(b)Find the current in the circuit shown in fig. 1 for t>0. At $t=0^-$ the network was unenergized.

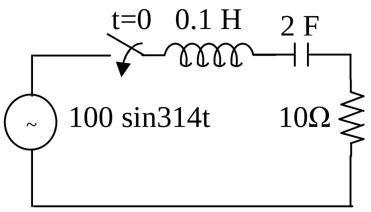


Figure 1

5. Find the y-parameters for the network shown in Figure 2 by considering it to be a parallel combination of a resistive network referred to as N_a and a capacitive network referred to as N_b.

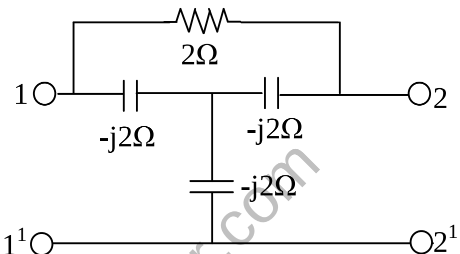
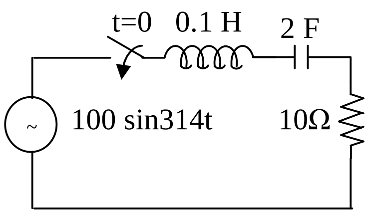


Figure 2

6. (a) Test whether F(s) = $\dfrac{s^2+6s+5}{s^2+9s+14}$ is positive real function.
(b) Determine the Foster I form of realization of the RC impedance function.
Z(s) = $\dfrac{(s+1)(s+3)}{s(s+2)(s+4)}$

7. (a) Explain about the trignometric form of Fourier series.
(b) A voltage $v(t)=\dfrac{4}{\pi}\left[\dfrac{\sin 2\pi t}{1}+\dfrac{\sin 6\pi t}{3}+\dfrac{\sin 10\pi t}{5}+.....+\infty\right]$ is applied to a circuit consisting of resistance R=4 ohms in series with an inductance of $L=\dfrac{1}{\pi}$H. Calculate the current in the circuit.



Figure