

II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019**ELECTRICAL CIRCUIT ANALYSIS-II**

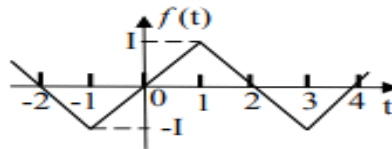
(Electrical and Electronics Engineering)

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 **Four** Questions from **Part-B****PART -A**

1. a) Derive relationship between line voltage and phase voltages in star connected system. (2M)
- b) Explain how the active power and reactive power is measured in a 3-phase balanced system. (3M)
- c) Derive transient response for R-L circuit using AC excitation. (2M)
- d) Derive expressions for transmission parameters of two two-port networks connected in cascade. (2M)
- e) State the properties of positive real function. (2M)
- f) Calculate the Fourier series for the function shown Figure bellow. (3M)

**PART -B**

2. a) Derive voltage and current relations in Star connected Balanced load and draw the phasor Diagrams. (7M)
- b) A balanced three phase load of $20+j10\Omega$ per phase is connected in delta across 440V, 3 phase supply. Determine line currents, phase currents & Total active power. Also draw the phasor diagram. (7M)
3. a) A 3 phase 3 wire balanced supply is connected to an unbalanced 3 wire star connected load. Derive an expression for the neutral displacement voltage between supply and load neutral points. (7M)
- b) A balanced 3 phase, 3 wire 50 Hz 100 volt supply is given to a load consisting of three impedances $Z_A = (1+j1)$, $Z_B = (1+j2)$ and $Z_C = (3+j4)$ ohms connected in star as shown in Figure 1. Compute the voltages across and currents in the three phases of the load using Loop current method. Phase sequence ABC. (7M)

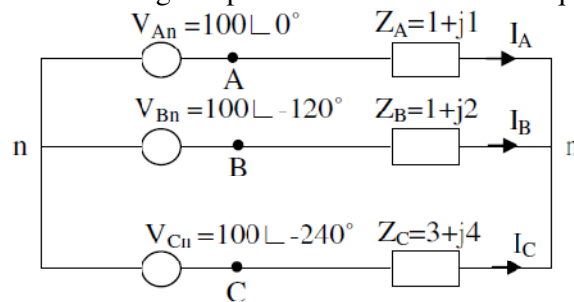


Figure 1

4. a) In a series RLC circuit, $R=6$ ohms, $L=2$ H, $C=2$ F. A DC voltage of 50 V is applied at $t=0$. Obtain the expression for $i(t)$ using differential equation approach. (7M)
- b) Derive the expression for transient response in series R-L-C circuit for AC excitation. Obtain the solution using Laplace transforms. (7M)
5. For the two port network given below (shown in Figure.2). Determine Y and ABCD parameters. (14M)

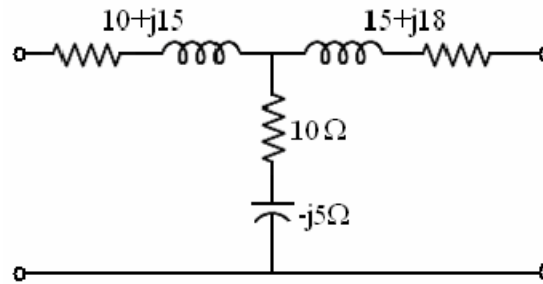
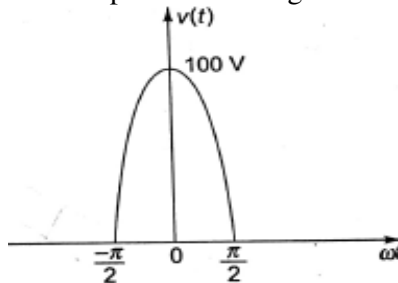


Figure 2

6. a) Explain the procedure to test whether a function can be represented as an L-C immittance form and hence explain how synthesizing the network is to be carried out in second Foster form. (7M)
- b) Realise the function $Z(s) = \frac{s(s^2+4)}{2(s^2+1)((s^2+9))}$ in both the Cauer and Foster forms of LC networks. (7M)
7. a) Determine the Fourier series expansion of the given wave form. (7M)



- b) Find the Fourier transform of the following functions: (7M)
- $\delta(t-t_0)$
 - $\cos \omega t$
 - $e^{j\omega_0 t}$

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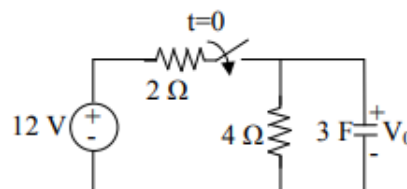
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**PART -A**

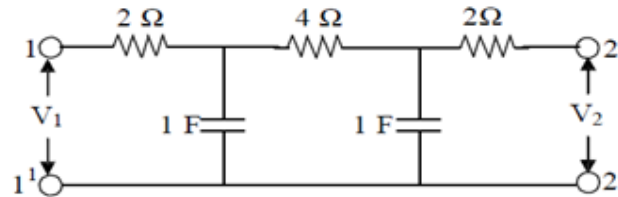
1. a) A balanced 3 ph load draws 100kW at a lagging power factor of 0.9 from a 400V, 3 phase, 50Hz main. Calculate line currents and phase currents of the circuit. (2M)
- b) The following unbalanced star-connected impedances are connected to a 400V, three phase system:  $Z_R = j10 \Omega$ ,  $Z_Y = j5 \Omega$ , and  $Z_B = -j5 \Omega$ , Calculate the line currents and phase currents. . (3M)
- c) Derive transient response for R-C circuit using AC excitation. (2M)
- d) Why Y-parameters are known as short circuit parameters. (2M)
- e) State the Caue forms of synthesizing a network. (2M)
- f) What is the physical significance of Fourier transform? (3M)

**PART -B**

2. a) Derive the relationship between phase quantities and line quantities in a 3 phase balanced (i) star connected system and (ii) Delta connected system. Draw phasor diagrams. Showing voltages and currents. (7M)
- b) A balanced three phase load of  $(2+j10\Omega)$  per phase is connected in delta across 440V, 3 phase supply. Determine line currents, phase currents & Total active power. Also draw the phasor diagram (7M)
3. a) Explain 3-phase active power measurement by Two watt meter method .Also, Discuss The effect of power factor on wattmeter readings. (7M)
- b) The two-wattmeter method produces wattmeter readings  $P_1 = 1600 \text{ W}$  and  $P_2 = 2500 \text{ W}$  when connected to a delta-connected load. If the line voltage is 220 V, calculate: i) per- phase average power, ii) per-phase reactive power, iii) phase impedance. (7M)
4. a) Discuss the transient analysis of RLC series circuit excited by D.C. voltage. (7M)
- b) If the switch in given figure has been open for a long time and is closed at  $t=0$ , find  $V_0(t)$ . (7M)



5. a) Derive the ABCD parameters for the network shown in figure as a cascade connection of two identical networks. (7M)



- b) The Z-parameters of a two port network are  $Z_{11}=13\ \Omega$ ,  $Z_{22}=25\ \Omega$ ,  $Z_{12}=Z_{21}=10\ \Omega$  then Determine ABCD parameters. (7M)
6. a) State and explain the properties of L-C immittance functions, deriving necessary expressions. (7M)
- b) The driving point impedance for of an LC network is given by  $\frac{10s^4+12s^2+1}{2s(s^2+4)}$ . (7M)  
Obtain the first form of Cauer LC network.
7. a) Explain any four properties of Fourier transform and write electrical applications of Fourier transform. (7M)
- b) Find the Fourier transform of the following functions: (7M)
- $\delta(t-t_0)$
  - $\cos \omega t$
  - $e^{j\omega_0 t}$

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PART -A

1. a) Derive the relations between phase and line values of star and delta connected balanced system. (2M)
- b) How two watt meter method effects the p.f. reading on watt meters (2M)
- c) What are the steps used to evaluate initial conditions. (2M)
- d) Derive the expression for Y parameters in terms of ABCD parameters. (2M)
- e) Test whether the following function is positive real or not. (3M)

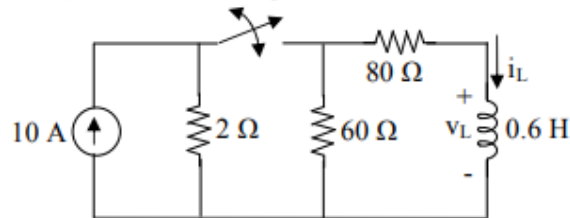
$$F(s) = \frac{s^2+4}{s^3+3s^2+3s+1}$$

- f) List the properties of Fourier transforms (3M)

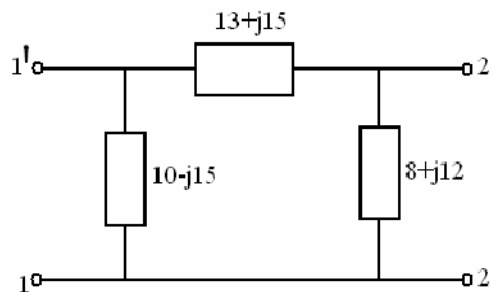
PART -B

2. a) A balanced three load of $(15-j20)\Omega$ per phase is delta connected across 220V, 50Hz, 3-phase supply. Calculate total active and reactive power. Also draw the complete phasor diagram. (7M)
- b) In a three phase balanced load, each arm consists of a resistor of 10 ohms, an inductance of 0.6 H and a capacitor of $130 \mu\text{F}$ connected in series. The supply is a balanced 3-phase 400 V, 50 Hz. Calculate the line current, total power consumed in the load when the three arms are connected in star and delta. (7M)
3. a) A 400V, three-phase supply feeds an unbalanced three-wire, star-connected load. The branch impedances of the load are $Z_R = (4+j8) \Omega$; $Z_Y = (3+j4) \Omega$; $Z_B = (15+j20) \Omega$. Find the line currents and voltage across each phase impedance. Assume the RYB phase sequence. (7M)
- b) The power taken by a 440 V, 50Hz, three-phase induction motor on full load is measured by two wattmeter method, they indicate 250W and 1000W respectively. Calculate i) the input ii) the power factor iii) the current and the motor output, if the efficiency is 80%. (7M)

4. a) Derive the expression for transient response in series R-L circuit for AC excitation. Obtain the solution using Laplace transforms. (7M)
- b) For given figure, the switch is closed at $t=0$, determine the equations of I_L and V_L . (7M)



5. For the two port network given below. Determine ABCD & hybrid parameters. (14M)

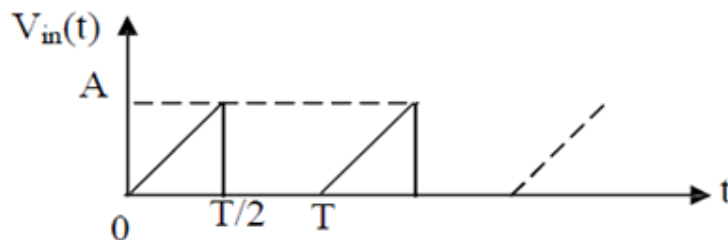


6. a) Determine the Foster I form of realization of the RC impedance function. (7M)

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

- b) Diagnose whether the following impedance function represents a RL or RC network and find its Cauer form. $Z(s) = \frac{(s+4)(s+6)}{(s+3)(s+5)}$ (7M)

7. a) Obtain the trigonometric Fourier series for the waveform shown in below figure (7M)



- b) State and prove differentiation and Integration properties of Fourier Transform. (7M)

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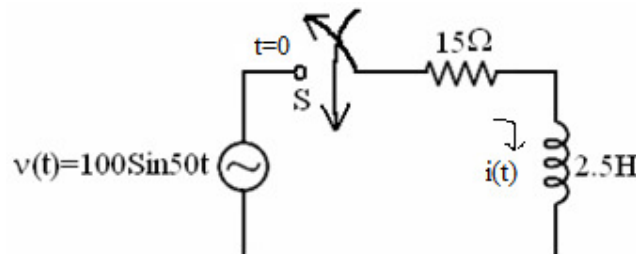
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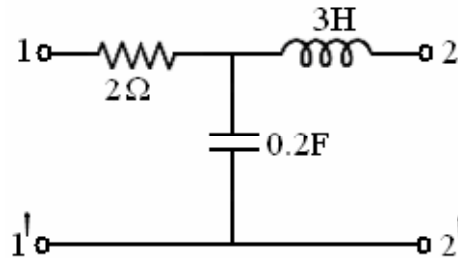
1. a) Derive the relations between phase and line values of star and delta connected balanced system. (2M)
- b) List effects of power factor on measurement of three phase power using two watt meter method. (2M)
- c) Derive the transient response of RL series circuit with DC input. (3M)
- d) Derive the expression for Z parameters in terms of Y parameters. (3M)
- e) List the properties of positive real function. (2M)
- f) What are the conditions of symmetry? (2M)

PART -B

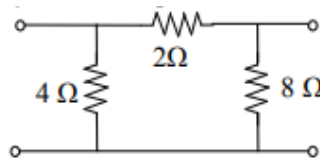
2. a) A 3phase 4000V system has a delta connected load with $Z_{ab}=(8+j6)$ $Z_{bc}=(8+j6)$ and $Z_{ca}=(8+j6)$. Find the phase currents and line currents. Determine the power consumed by each load impedance. Draw the phasor diagram. (7M)
- b) Explain how to measurement of active and reactive power in balanced three phase systems. (7M)
3. a) Three star connected impedances $Z_a=20\angle 45^\circ\Omega$, $Z_b=25\angle 60^\circ\Omega$, $Z_c=15\angle 45^\circ\Omega$ are connected 3- ϕ -400V, 50Hz a.c. supply. Determine the line currents and two wattmeter readings when power is measured by 2 wattmeter method. a, b, c is the phase sequence. (7M)
- b) Explain measurement of three phase Power by two watt meter method. (7M)
4. a) A circuit consists of a 10 μ F capacitor connected in series with a 25K Ohm resistor with a switchable 100 V d.c supply. When the supply is connected, calculate: (i) The time constant. (ii) The maximum current. (iii) The voltage across the capacitor after 0.5s. (7M)
- b) A sinusoidal voltage of $100\sin 50t$ is applied to a series circuit of $R = 15\Omega$ and $L = 2.5H$ at $t=0$ shown in below Figure. By Laplace transform method, determine the current $i(t)$ for all $t \geq 0$. Assume zero initial conditions (7M)



5. a) For the following network shown in below Figure. Determine h-parameters. (7M)



- b) Obtain ABCD parameters of the network shown in below figure. (7M)



6. a) State and explain the properties of L-C immittance functions, deriving necessary expressions. (7M)
- b) A driving point function is given by $F(s) = \frac{s^2 + 6s + 8}{(s^2 + 4s + 3)}$. Show that the function can be realised in both the Cauer RC and RL forms. (7M)
7. a) Briefly Explain the line and phase angle spectra of a given signal $f(t)$. (7M)
- b) Find the Fourier transform of the following functions (7M)
- i) 1 ii) Signum function iii) unit step function