Code No: R1621021 **R16** SET - 1

II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2018
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**

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PART –A

1. a) A balanced star connected load of (8-j4) ohms per phase is connected to a 3-phase, 400 V, 50 Hz supply. Find line current, power factor and active power. (3M)
   b) The power measurement in a 3-phase circuit is made by using two wattmeters and their readings are (i) W_1=1.5 kW and W_2=2 kW (ii) W_1=2 kW and W_2=2 kW after reversal of current coil connection. Find power factor in each case. (3M)
   c) Define time constant of an R-L circuit and R-C circuit. What is its significance in electrical circuits? (2M)
   d) Give the expressions for symmetry and reciprocity in case of Z-parameters. (2M)
   e) Write the properties of a positive real function. (2M)
   f) What is the difference between line spectra and phase angle spectra? (2M)

PART -B

2. a) Draw phasor diagram of currents for a balanced delta-connected supply system and establish relation between line currents and phase currents. (7M)
   b) Each phase of a balanced three phase delta connected load has a 0.2 Henry inductor in series with a parallel combination of a 6 μF capacitor and 90 Ω resistance. If a 3-phase voltage of 400 V at a frequency of 50Hz is applied to this load, find i) phase current ii) line current and iii) total power absorbed by the load. (7M)

3. The following impedances are connected in the form of a star connected unbalanced system and it is connected to a 400 V, 3-ϕ supply: $Z_R = 8\angle 30^0\ \Omega$, $Z_Y = 10\angle 20^0\ \Omega$, $Z_B = 20\angle 0^0\ \Omega$. Calculate line currents by using (i) loop method (ii) Star-delta transformation technique. (14M)

4. a) Derive an expression for voltage across 'R' in a series R-C circuit excited by a unit step voltage. Assume zero initial conditions. (7M)
   b) A sinusoidal voltage $v(t) = V\sin 100\pi t$ is applied at t = 0.02 seconds to a series R-L circuit, where R=20 ohms and L=0.2 H. Calculate the ratio of maximum value of current (to which it rises) to the steady state value of current. (7M)

5. a) Express hybrid parameters as a function of transmission parameters. (7M)
   b) Find the hybrid parameters of the network shown in Figure 1. (7M)

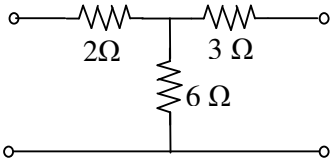

Figure 1
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6. The driving point impedance of an LC network is given by $Z(s) = 10\frac{(s^2+4)(s^2+16)}{s(s^2+9)}$. Obtain the First and Second forms of Foster network. (14 M)

7. Find the Fourier series of the signal shown in Figure 2, where A =100 V, T = 25π ms and determine the fundamental current in a series R-L circuit with R = 5Ω and L = 0.02 H. (14 M)

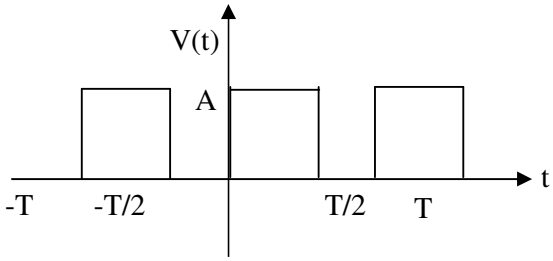

Figure 2

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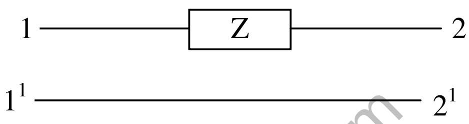
PART –A

1. a) A balanced star connected load of (5+j4) ohms per phase is connected to a 3-phase, 400 V, 50 Hz supply. Find real, reactive and complex power in the load. (3M)

b) Three identical impedances of $9\angle-30^0$ ohms in delta and three impedances $5\angle45^0$ ohms in star are both connected to the same three phase three wire 480 V supply, RYB system. Find the magnitude of line current. (3M)

c) What is the difference between steady state and transient response? (2M)

d) Find Z and Y parameters if they exist for the two-port network shown below. (2M)



e) Define LC immittance function. Write features of LC immittance function. (2M)

f) What is physical significance of the Fourier Transform? (2M)

PART -B

2. a) 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. (7M)

b) A balanced delta-connected three-phase load absorbs a complex power of 100 kVA with a lagging power factor of 0.8 when the r.m.s line to line voltage is 2400 V. Calculate the impedance of each arm of the delta-connected load. (7M)

3. A 400 V, 3-phase balanced supply is connected to an unbalanced delta load having three impedances $Z_{AB}=10\angle-90^0\ \Omega$, $Z_{BC}=6\angle71.56^0\ \Omega$, $Z_{CA}=50\,\Omega$. Calculate line currents and power consumed if (i) the phase sequence is ABC (ii) the phase sequence ACB. (14 M)

4. A sinusoidal voltage V(t) = V_m sin(ωt+θ) is applied to a R-L circuit at time t = 0. Find the complete solution for the current in the circuit using Laplace transform method and differential equations. (14 M)
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5. a) Derive the condition of symmetry and reciprocity for ABCD-parameters of given two port network. (7M)
   b) Obtain the Y-parameters for the network shown in Figure 1. (7M)

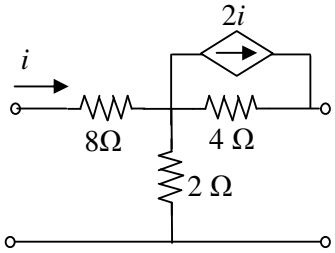

Figure 1

6. Obtain the First and Second forms of Cauer network for the function: (14 M)

$$Z(s) = \frac{s^2 + 5s + 4}{s^2 + 2s}.$$

7. The voltage having the waveform shown in fig. 2a is applied to the circuit shown in fig. 2b. Determine i(t). (14 M)

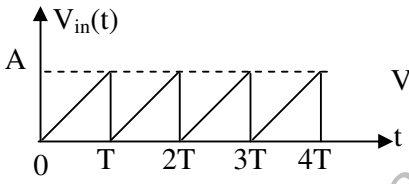

Fig. 2a

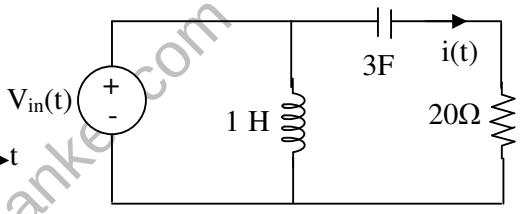

Fig. 2b

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PART –A

1. a) A balanced star connected load with impedance of $6\angle 45^0\ \Omega$ is connected to a three-phase four-wire 208 V supply in RYB sequence. Find line currents and neutral current. (3M)
   b) The wattmeters in lines R and Y of a 120 V, RYB system reads 1500 watts and 500 watts respectively. Find impedance of the balanced delta connected load. (3M)
   c) Write about initial conditions of L and C in a RLC series circuit. (2M)
   d) Define symmetry and reciprocity of a two port network. (2M)
   e) What is the need of Foster and Cauer form in electrical circuits? (2M)
   f) What are the properties of Fourier Transform? (2M)

PART -B

2. a) Prove that current in neutral line connected between star point of a balanced star connected load to star point of balanced star connected supply is zero. (7M)
   b) Three inductive coils each of resistance 4 ohms and an inductive reactance of 5 ohms are connected in star and supplied from three phase 400V 50 Hz supply. What are the line and phase currents and voltages? Also calculate the power input and power factor. (7M)

3. A 400 V, 3-phase supply is connected to an unbalanced load having three impedances of $Z_R = 4 + j3\,\Omega$, $Z_Y = 4 - j3\,\Omega$, $Z_B = 2.5\,\Omega$. Also $Z_N = 0.3 + j1\,\Omega$. Find phase currents, voltage across loads and neutral current. (14 M)

4. a) A series RC circuit is excited by a pulse of amplitude 10V and duration 2 sec. Compute voltage across capacitor. Assume R= 5Ω, C = 5F, and zero initial change on the capacitor. (7M)
   b) 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 (7M)

5. Determine the ABCD parameters for the network shown in fig.1 (14 M)

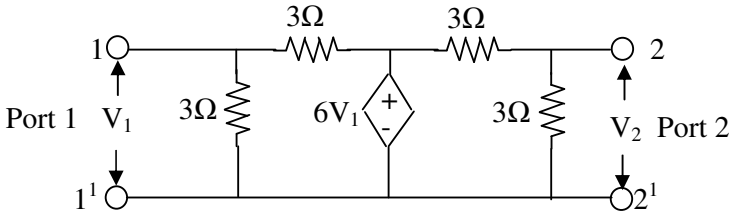

Fig.1
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6. Realize foster forms of the following LC impedance function: (14 M)

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

7. Determine the total solution for i(t) in the circuit of Figure 2 using Fourier transform. (14 M)

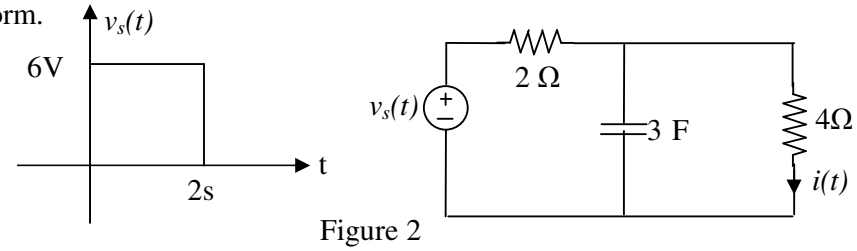

Figure 2

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PART –A

1. a) The wattmeters in line A and B of 173.2 volts RYB system read -301 watts and 1327 watts respectively. Find impedances of the balanced star-connected load. (3M)
   b) What are the reasons for unbalance of phases in a 3-phase system? (2M)
   c) A circuit consists of a resistor connected in series with a 0.5 µF capacitor and has a time constant of 12 milli-sec. Determine the value of the resistor and capacitor voltage at 7 milli-sec after connecting the circuit to a 10 V supply. (3M)
   d) What is cascaded connection of two port networks? Which type of 2-port parameters is ideal for such a cascaded connection? (2M)
   e) What are the properties of R-C impedance and R-L admittance functions. (2M)
   f) Write the conditions of symmetry of a Fourier series. (2M)

PART -B

2. a) Explain the procedure to measure reactive power in balanced three phase system using single wattmeter with a neat connection diagram. (7M)
   b) Each phase of a balanced three phase delta connected load has impedance of (3.5-j3) Ω. If a 3-phase voltage of 400 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. (7M)

3. a) Show that in two-wattmeter method, the sum of the meter readings equals total power dissipated in the load, whether the load is balanced or unbalanced, star – connected or delta - connected (7M)
   b) An unbalanced star – connected load is supplied from a three-wire supply with a line voltage of 200V at 60Hz frequency. The load components are $R_1 = R_2 = R_3 = 50\Omega$, and $L_3 = 398mH$. Calculate the line currents I_A, I_B and I_C. (7M)

4. a) Determine the transient and steady state currents through a series R-C circuit when it is connected to a sinusoidal voltage source. (7M)
   b) In a series RLC circuit L=0.3 H, and C=4 F. A DC voltage of 50 V is applied at t=0. Obtain an expression for current i (t) in the circuit, when (i) R= 5 Ω (ii) R= 6 Ω. (7M)
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5. Determine the Z and Y-parameters of the network shown in fig. 1 (14 M)

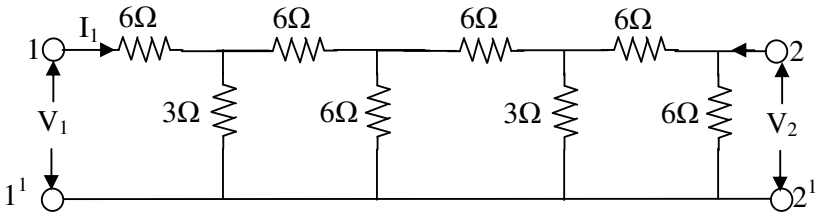

Fig.1

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) Obtain the Cauer form I realization of $F(s) = \frac{2(s+1)(s+3)}{s(s+2)}$ (7M)

7. a) Explain about the exponential form of Fourier series. (7M)

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