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

II B. Tech I Semester Regular Examinations, October/November - 2017
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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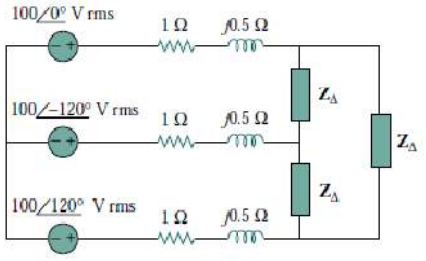
PART –A

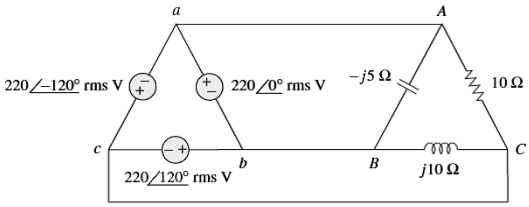
1. a) Why three phase systems are preferred over single phase systems for the transmission of power? (3M)
   b) Determine the amplitude of the line current in a three-phase system with a line voltage of 300 V that supplies 1200 W to a delta connected load at a lagging PF of 0.8; then find the phase impedance. (2M)
   c) A coil of inductance 0.04H and resistance 10 Ω is connected to a 120V, d.c. supply. Determine (i) the final value of current, (ii) the time constant of the circuit, (2M)
   d) A two-port network is described by $V_1=I_1+2V_2$, $I_2= -2I_1+0.4V_2$ Write the impedance matrix ? (2M)
   e) List the properties of RL impedance function? (3M)
   f) State and explain parseval's theorem? (2M)

PART -B

2. a) In a balanced three-phase Y-Y system, the source is an *abc* sequence of voltages and $V_{an} = 220\angle 20^0$ V rms. The line impedance per phase is $(0.6 + j1.2)\,\Omega$ while the per-phase impedance of the load is $(10 + j14)\,\Omega$. Calculate the line currents and the load voltages (7M)
   b) For the three-phase circuit shown below, find the average power absorbed by the delta-connected load with $\mathbf{Z_\Delta} = (21 + j\,24)\,\Omega$ (7M)



3. a) Find the line currents in the unbalanced three-phase circuit of Fig shown below and the real power absorbed by the load. (7M)



   b) The two-wattmeter method gives P_1=1200Wand P_2= -400W for a three-phase motor running on a 240-V line. Assume that the motor load is wye connected and that it draws a line current of 6 A. Calculate the pf of the motor and its phase impedance. (7M)
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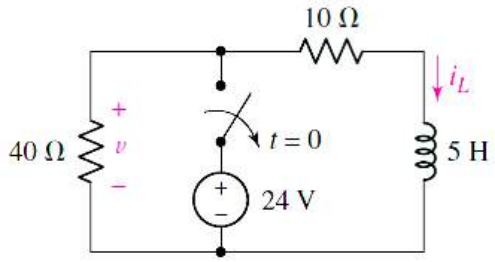
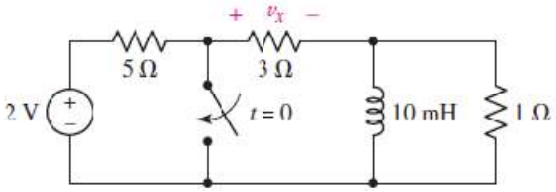
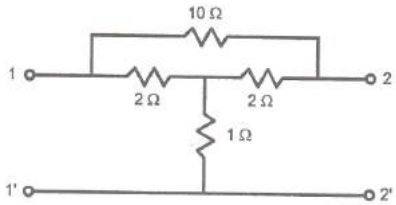
4. a) For the circuit shown, find the voltage labelled v at t = 200 ms. (7M)



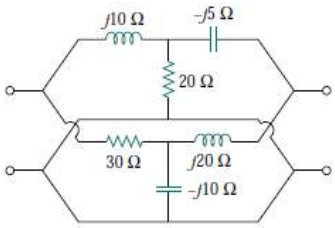
b) Obtain an expression for v_x as labelled in the circuit shown and evaluate v_x at t = 5 ms. (7M)



5. a) Obtain the ABCD parameters of the circuit shown below (7M)



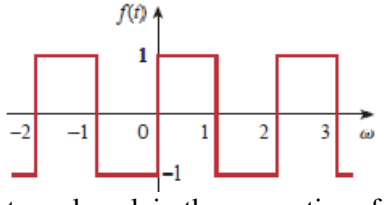
b) Determine the y parameters of the two two-ports in parallel shown in fig. (7M)



6. a) F(s) = [2 (s+1) (s+4)] / [(s+2) (s+6)] .Synthesize F(s) in two Foster forms? (7M)

b) Synthesize the following driving point immittance function $Z(s) = \frac{(s^2+2s+6)}{s(s+3)}$ (7M)

7. a) Find the Fourier series of the square wave shown in Fig. Plot the amplitude and phase spectra. (9M)



b) State and explain the properties of Fourier transform? (5M)

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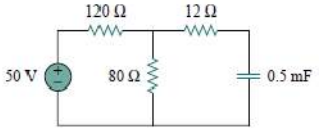
PART –A

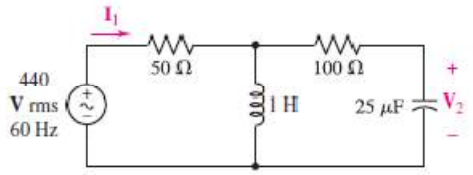
1. a) State the relationships between line and phase currents and line and phase voltages for a star-connected system (3M)
   b) Two wattmeters connected to a 3-phase motor indicate the total power input to be 12kW. The power factor is 0.6. Determine the readings of each wattmeter? (3M)
   c) Find the time constant for the *RC* circuit in Fig. (2M)



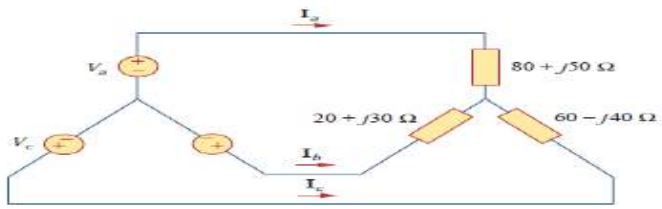
   d) Find the T parameters of two networks which are connected in cascade having individual T parameters $T_a = \begin{pmatrix} 5 & 44 \\ 1 & 9 \end{pmatrix}$ *and* $T_b = \begin{pmatrix} 1 & 6 \\ 0.5 & 4 \end{pmatrix}$. (2M)
   e) List any two properties of Positive Real function? (2M)
   f) List any two properties of Fourier transform? (2M)

PART –B

2. a) A particular balanced three-phase system is supplying a Δconnected load with 10 kW at a leading power factor of 0.7. If the phase voltage is 208 V and the source operates at 50 V, (*i*) compute the line current; (*ii*) determine the phase impedance; (*iii*) calculate the new power factor and new total power delivered to the load if a 2.5 H inductor is connected in parallel with each phase of the load. (7M)
   b) A wattmeter is connected into the circuit shown below, so that $\mathbf{I}_1$ enters the (+) terminal of the current coil, while $\mathbf{V}_2$ is the voltage across the potential coil. Find the wattmeter reading. (7M)



3. a) Determine the line currents for the three-phase circuit shown. $V_a = 110\angle 0^0$. Assume positive phase sequence (7M)



   b) A 415V, 3-phase, 4 wire, star-connected system supplies three resistive loads of 25kW, 20kW and 35kW in the red, yellow and blue phases respectively. Determine the current flowing in each of the four conductors. (7M)
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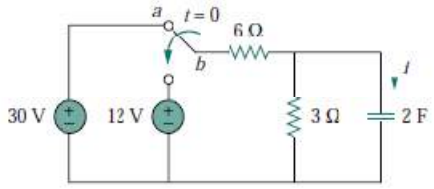
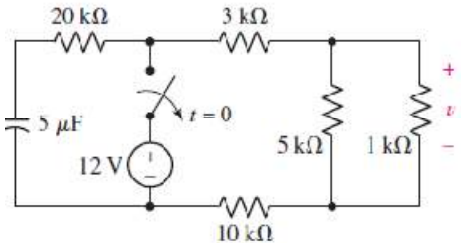
4. a) The switch has been in position **a** for a long time. At t=0 it moves to position **b**. Calculate i(t) for all t>0. (7M)

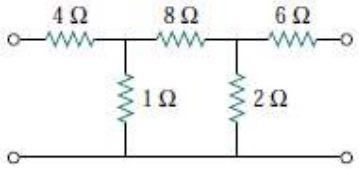


b) The switch above the 12 V source in the circuit shown has been closed for a long time. It is finally thrown open at $t = 0$. (i) Compute the circuit time constant. (*ii*) Obtain an expression for $v(t)$ valid for $t > 0$. (iii) Calculate the energy stored in the capacitor 170 ms after the switch is opened. (7M)



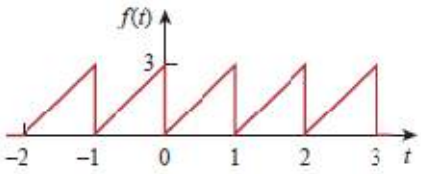
5. a) Derive the relationship between hybrid and Z parameters of two port network? (7M)

b) Find the transmission parameters for the circuit shown below (7M)



6. Realize $Z(s) = [S(S^2+2)(S^2+4)]/[(S^2+1)(S^2+3)(S^2+5)]$ in all four forms. (14 M)

7. a) Determine the Fourier series of the sawtooth waveform shown in Figure (9M)



b) (a) A series RL circuit in which R = 5 Ω and L =20 mH has an applied voltage v =100 + 50 sin ωt +25 sin 3ωt (V), with ω= 500 rad/s. Find the current and the average power (5M)

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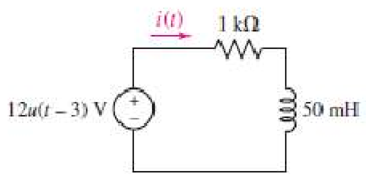
PART –A

1. a) Three loads, each of resistance 50 Ω are connected in star to a 400V, 3-phase supply. Determine (i) the phase voltage, (ii) the phase current and (iii) the line current. (3M)

b) Explain the difference between "balanced" and "unbalanced" loads? (2M)

c) For the circuit shown, find i(t) for t=∞, 3^- and 3^+ . (3M)



d) Write down condition for reciprocal of a two port network in terms of transmission parameters and hybrid parameters? (2M)

e) List any two properties of LC immittance function? (2M)

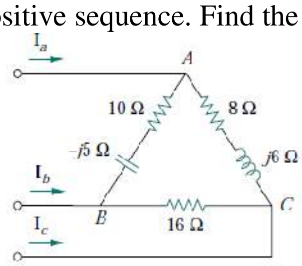
f) The voltage and current at the terminals of a circuit are V(t)=128+192cos 120Πt + 96cos(360Πt-30^0) and i(t) = 8cos(120Πt-10^0) + 3.2cos(360Πt-60^0). Find the average power absorbed by the circuit? (2M)

PART –B

2. a) A three-phase system is constructed from a balanced Y-connected source operating at 50 Hz and having a line voltage of 210 V, and each phase of the balanced load draws 130 W at a leading power factor of 0.75. (*i*) Calculate the line current and the total power supplied to the load. (*ii*) If a purely resistive load of 1Ω is connected in parallel with each existing load, calculate the new line current and total power supplied to the load. (7M)

b) The two-wattmeter method produces wattmeter readings P_1=1560 W and P_2=2100 W and when connected to a delta-connected load. If the line voltage is 220 V, calculate: (i) the per-phase average power, (ii) the per phase reactive power, (iii) the power factor, and (iv) the phase impedance. (7M)

3. a) The unbalanced Δ-load of Fig. is supplied by balanced voltages of 200V in the positive sequence. Find the line currents. Take $\mathbf{V}_{ab}$ as reference. (7M)



b) Prove that two watt-meters are sufficient to measure power in three phase system? (7M)
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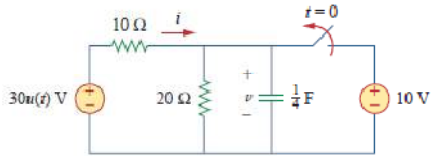
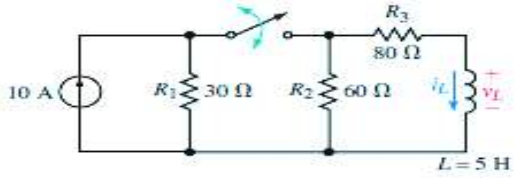
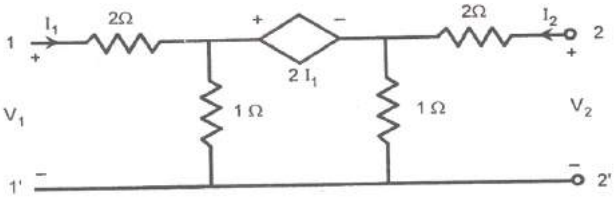
4. a) In Fig. shown, the switch has been closed for a long time and is opened at t= 0. Find i and v for all time. (7M)



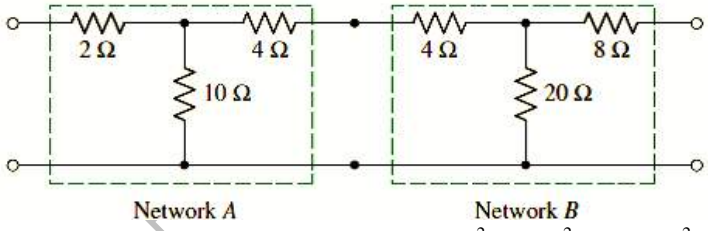
b) Refer to the circuit shown below, the switch is closed at t = 0. (i) determine equations for i_L and v_L.(ii) At t = 300 ms, open the switch and determine equations for i_L and v_L during the decay phase. (iii) Determine voltage and current at t = 100 ms and at t =350 ms. (iv) Sketch i_L and v_L (7M)



5. a) Obtain the *y* parameters for the *network* shown below. (7M)



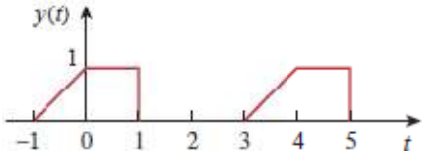
b) Find the transmission parameters for the cascaded networks shown (7M)



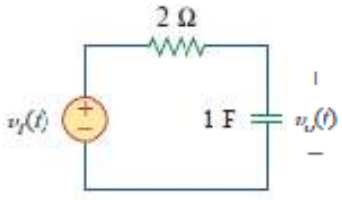
6. a) Synthesize the LC immittance function $Z(s)=2(s^2+1)(s^2+9)/s(s^2+4)$ in two Foster forms? (7M)

b) State and explain the properties of positive real function. (7M)

7. a) Obtain the exponential Fourier series for the signal in Fig. (9M)



b) Find $v_o(t)$ in the circuit shown for $v_i(t)=2e^{-3t}u(t)$. (5M)



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PART –A

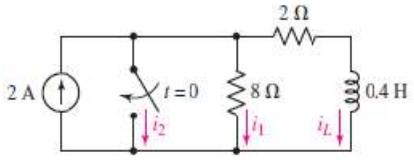
1. a) Draw the complete phasor diagram for balanced delta connected load? (2M)
   b) A 400V, 3-phase, 4 wire, star-connected system supplies three resistive loads of 15kW, 20kW and 25kW in the red, yellow and blue phases respectively. Determine the currents flowing in red and blue phase conductors. (2M)
   c) Draw the transient growth and decay curves for an $L-R$ circuit ? (3M)
   d) Write down the condition for reciprocity in terms of ABCD and hybrid parameters? (2M)
   e) List the properties of RC impedance function? (3M)
   f) What is the condition for half wave symmetry and odd symmetry of function? (2M)

PART –B

2. a) A three-phase, three-wire, ABC system, with an effective line voltage of 200 V, has three impedances of $10\angle 45^0\Omega$ in a Δ connection. Determine the line currents and draw the voltage-current phasor diagram. (7M)
   b) Show that the total power in a 3-phase, 3-wire system using the two-wattmeter method of measurement is given by the sum of the wattmeter readings. Draw a connection diagram. Draw a phasor diagram for the two-wattmeter method for a balanced load. Use the phasor diagram to derive a formula from which the power factor of a 3-phase system may be determined using only the wattmeter readings (7M)

3. a) A four-wire wye-wye circuit has $\mathbf{V}an = 120\angle 120^\circ$, $\mathbf{V}bn = 120\angle 0^\circ$ $\mathbf{V}cn = 120\angle -120^\circ$ V If the impedances are $\mathbf{Z}_{an} = 20\angle 60^\circ$, $\mathbf{Z}_{bn} = 30\angle 0^\circ$ $\mathbf{Z}cn = 40\angle 30^\circ\ \Omega$ find the current in the neutral line (5M)
   b) Three impedances of (7+j4) Ω, (3+j2) Ω and (9+j2) Ω are connected between neutral and the R, Y and B phases. The line voltage is 440V, Calculate. (9M)
   i. The line currents and
   ii. The current in the neutral wire.
   iii. Find the power consumed in each phase and the total power drawn by the circuit

4. a) At t = 0.15 s in the circuit of Fig., find the value of (i) i_L; (ii) i_1; (iii) i_2. (7M)



   b) Derive the expression for current in a series RC circuit excited by a sinusoidal source $V=V_m \sin\omega t$ (7M)
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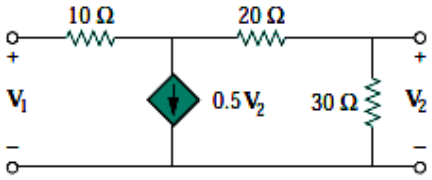
5. a) Obtain the z parameters for the circuit shown. (7M)



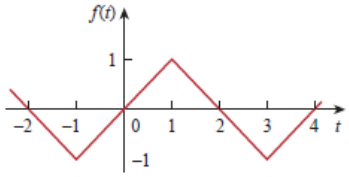
b) If h parameters of for some particular two-port is given below. Calculate y parameters. (7M)

$$h=\begin{pmatrix} 2K\Omega & -3 \\ 5 & 0.01S \end{pmatrix}$$

6. a) Given the driving point admittance function Y (s) = $S(S^2+1)(S^2+4) / S(S^2+2)$. (7M)
Synthesize ladder network of the first Cauer form.

b) Obtain the foster forms realization of $Z(s)=2(s+1)(s+3)/s(s+2)$ (7M)

7. a) Calculate the Fourier series for the function shown in fig. (7M)



b) Determine the average power supplied to the circuit if (7M)
i(t)=2+10cos(t+10^0)+6cos(3t+35^0) A.