R20

II B. Tech I Semester Regular/Supplementary Examinations, January-2023
ELECTRICAL CIRCUIT ANALYSIS - II
(Electrical and Electronics Engineering)

Time: 3 hours　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　Max. Marks: 70

Answer any **FIVE** Questions, each Question from each unit
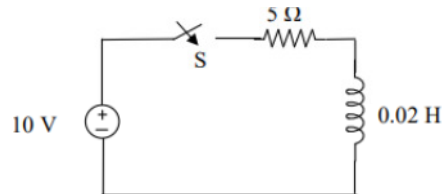All Questions carry **Equal** Marks
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UNIT-I

1　a)　With the help of phasor diagram, derive the relation between line and phase voltages, line and phase currents in a balanced delta connection.　[7M]

　　b)　A three phase balance delta connected load of (4+j8) Ω is connected across a 400V, 3-Φ balanced supply. Determine the phase currents and line currents. And also power drawn by the load. Assume RYB phase sequence　[7M]

OR

2　a)　A balanced three phase load consumes a power of 10 kW at 0.9 pf lag. If the power is measured by two wattmeter method, calculate the readings of the two watt-meters.　[7M]

　　b)　Three equal resistances connected in star across a three-phase balanced supply consume 1000 W. If the same three resistors were reconnected in delta across the same supply, determine the consumed power.　[7M]
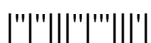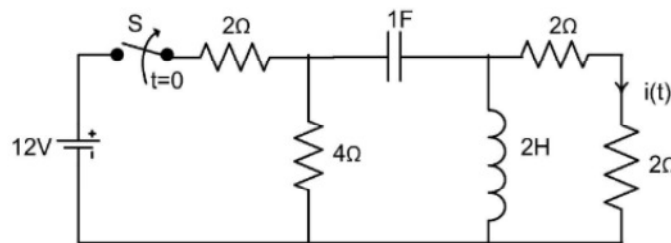
UNIT-II

3　a)　Find the response i(t) in a series RLC circuit when a step input of V volts is applied across it at time t = 0. Assume all initial conditions as zero.　[7M]

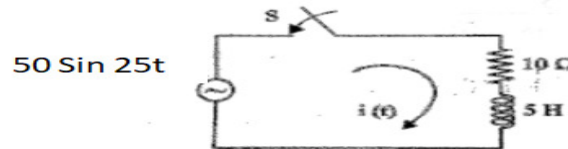　　b)　In an RL circuit shown in figure below, the switch closes at t = 0. Determine the complete current response.　[7M]

OR

4　The switch S in the circuit of the figure below is in the closed position for long time. At t=0, the switch opens. Find the expression for the current using Laplace transform.　[14M]

|"|"|||"|"|||'|

UNIT-III

5　a)　Derive the expression for V(t) of a parallel R - C circuit when excited by a sinusoidal current source.　　　[7M]

　b)　The circuit shown in figure consists of series RL elements. The sine wave is applied to the circuit when the switch is closed at t = 0. Determine the current i(t).　　　[7M]
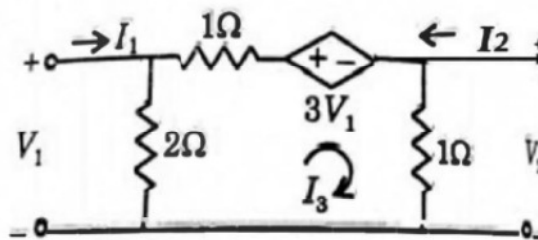

OR

6　A series R-C circuit with R=10 ohms and C= 2F has a sinusoidal voltage source 200 sin (500t+ φ) applied at time when φ =0.　　　[14M]
　(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

UNIT-IV

7　a)　Find the Z and Y parameters for the network shown below.　　　[7M]

　b)　Show that the overall admittance parameter matrix for parallel connected two port network is the sum of admittance parameters of each individual two port network in parallel.　　　[7M]
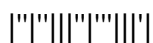
OR

8　a)　Derive the condition for reciprocity and symmetry of Z parameters.　　　[7M]

　b)　The port currents of a two port network are given by $I_1 = 4V_1 - 2V_2$, and $I_2 = -2V_1 + 5V_2$. Find the equivalent π network.　　　[7M]

UNIT-V

9　Write notes on the following:　　　[14M]
　i) High pass filter　ii) Band elimination filter　iii) m-derived filter

OR

10　a)　Derive the expression for characteristic impedance in a pass band filter.　　　[7M]

　b)　Design a band-elimination filter having design impedance of 250 ohm and cut-off frequencies $f_1 = 2$ kHz and $f_2 = 8$ kHz.　　　[7M]

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UNIT-I

1 a) Prove that the line voltage in a star connected RYB phase sequence three phase system leads the phase voltage by 30°. Obtain an expression for line voltage in terms of phase voltage. [7M]

   b) Each of two watt meters connected to measure the input to a three phase circuit reads 10 kW on a balanced load when the power factor is unity. What does each instrument read when power factor falls to 0.866 lagging. [7M]

OR

2 a) Explain Two-Wattmeter Method of three phase power measurement of a balanced load. [7M]

   b) An unbalanced 4 wire star connected load has a balanced voltage of 400V. The load are $Z_1=(4+j8)$ Ω, $Z_2=(5+j4)$Ω, $Z_3=(15+j20)$Ω. Calculate line currents, current in neutral wire, total power. [7M]
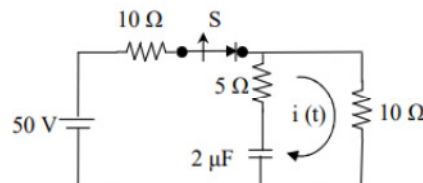
UNIT-II

3 In the given circuit shown in fig., the switch is closed to position 1 at t=0 and after a time equal to one time constant it is moved to position 2. Find the expression for current after moving to position 2. Assume zero initial charge on the capacitor. (Use Laplace transform technique).
(The values from figure: R= 500Ω, C=20μF) [14M]
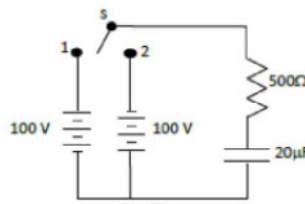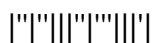

OR

4 a) For the circuit shown in Figure below, find the current equation when the switch is opened at t = 0. [7M]

   b) A constant voltage of 100V is applied at t=0 to a series RC circuit having R=5MΩ, and C=20μF. Assuming no initial charge to the capacitor, find expression for i, voltage across R and C. [7M]

|"|"|||"|"|||'|

UNIT-III

5 a) Derive an expression for the current response in R-L-C series circuit for a sinusoidal excitation   [7M]

   b) Find the voltage across the capacitance for t > 0 in the circuit shown in Figure   [7M]
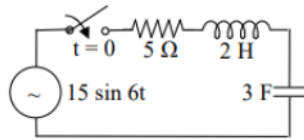
OR

6 A sinusoidal voltage V(t) = Vm 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.   [14M]

UNIT-IV

7 a) Find the transmission parameters of the following network and hence determine whether the network is reciprocal.   [7M]
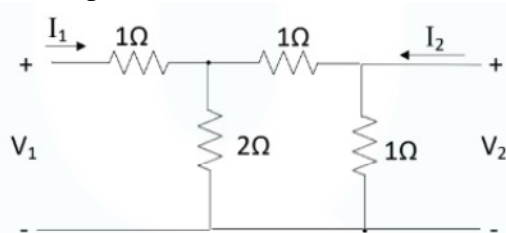
   b) The Z-parameters of a two-port network are Z_{11}= 10Ω, Z_{22}= 15Ω, Z_{12}= 5Ω and Z_{21}= 5Ω. Find the equivalent T-network and ABCD parameters.   [7M]

OR

8 a) Derive the expressions for Y-parameters in terms of ABCD parameters.   [7M]

   b) Determine the Z parameters of the following two port network.   [7M]
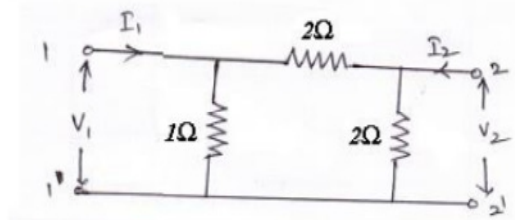
UNIT-V

9 a) What are the demerits of constant K- filter and how do we overcome with these demerits.   [7M]

   b) Design a band-pass filter having a design impedance of 500 ohm and cut-off frequencies of 3 kHz and 10 kHz.   [7M]

OR

10 a) What are the applications of m-derived low-pass filter?   [7M]

   b) Explain the design procedure of a constant K high pass filter.   [7M]
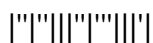
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UNIT-I

1 a) What are the merits and demerits of 3-phase system over single phase system?   [7M]

   b) Two watt meters are used to measure power in a 3-phase three wire load. Determine the total power, power factor and reactive power, if the two watt meters read   [7M]
       i) 1000W each, both positive
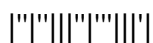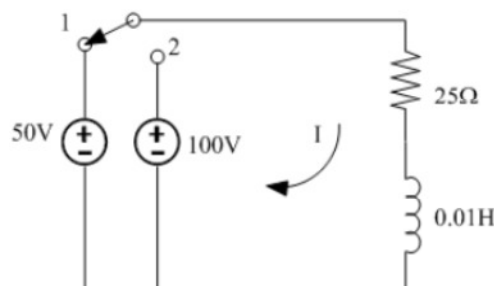   ii) 1000W each, but of opposite sign.

OR

2 a) Derive the relation between line and phase voltage of star connection with necessary diagrams.   [7M]

   b) A 400V, 3Φ supply feeds an unbalanced 3 wire star connected load. The branch impedances of the load are $Z_R=(4+j8)\Omega$, $Z_Y=(3+j4)\Omega$, $Z_B=(5+j20)\Omega$. Find the line currents and voltages across phase impedance. Assume RYB phase sequence.   [7M]

UNIT-II

3   A series RLC circuit consists of a resistance 20Ω, inductance 0.05H and capacitance 20µF in series with a 100 V constant voltage source when the switch is closed at t=0. Find the expression for the current in the circuit. Also find the current at t=3ms.   [14M]
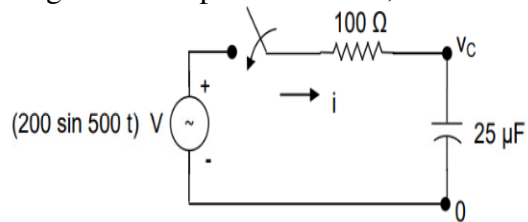
OR

4   In the RL circuit shown in figure below, the switch is in position 1 long enough to establish steady state conditions and at t=0, it is switched to position 2. Find the resulting current.   [14M]

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UNIT-III

5 a) Derive an expression for the current response in R-L series circuit with a sinusoidal source.　　[7M]

  b) For the circuit shown below, find the transient current, assuming that the initial charge on the capacitor as zero, when the switch is closed at time t = 0.　　[7M]

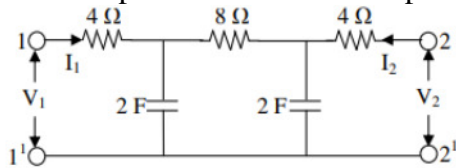

OR

6 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) A sinusoidal voltage v (t) =Vsin 100πt 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]

UNIT-IV

7 a) Find the z-parameters of the two port network shown in figure below　　[7M]

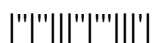 b) Explain about h-parameters in terms of y-parameters　　[7M]

OR

8 For a two port network, derive the　　[14M]
  i) z-parameters in terms of h-parameters and
  ii) ABCD parameters in terms of y-parameters.

UNIT-V

9 a) Design an m-derived low pass filter having cutoff frequency of 2 kHz, resonant frequency 1000 Hz and design impedance of 450 Ω.　　[7M]

  b) Explain the classification of pass band and stop band in detail.　　[7M]

OR

10 a) What is a constant K low pass filter, derive its characteristics impedance?　　[7M]

  b) Derive necessary expressions for m-derived high pass filter.　　[7M]

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SET - 4

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UNIT-I

1 a) A three-phase three-wire unbalanced load is star connected. The phase voltages of two of the arms are $V_R = 100\angle-10^o$, $V_Y = 150\angle-100^o$. Calculate voltage between star point of the load and the supply neutral. Assume RYB phase sequence.   **[7M]**

   b) Calculate the phase and line currents and the load impedance parameters in a balanced delta connected load which consumes a power of 25 kW at 0.866 power factor lag fed from a three phase 400V, 50 Hz supply.   **[7M]**

OR

2 a) A 220V3-Phase voltage is applied to a 3-phase balanced delta-connected load having a phase impedance $(6+j8)\Omega$. Find (i) the phasor current in each line (ii) what is the power consumed per phase.   **[7M]**

   b) The readings of the two watt meters used to measure power in a capacitive load are 6000 W and -2000W respectively. Calculate (i) the input power and (ii) the power factor at the load. Assume phase sequence as RYB.   **[7M]**
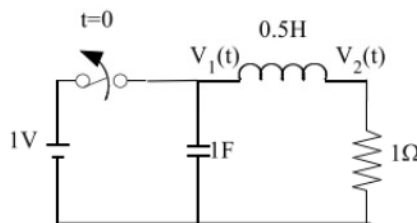
UNIT-II

3 The switch S in the circuit shown in below figure is in the closed position for long time. At t=0, the switch opens. Find the expression for the current using Laplace transform.   **[14M]**
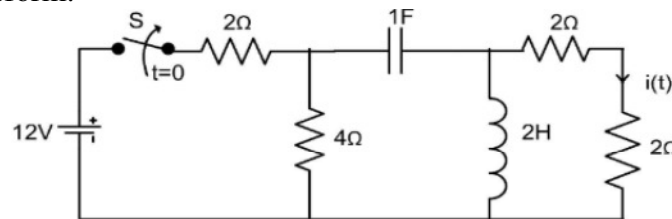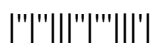

OR

4 a) In the network shown in figure below, the switch is opened at t= 0. Find out the current through the 1Ω resistor after opening the switch.   **[7M]**
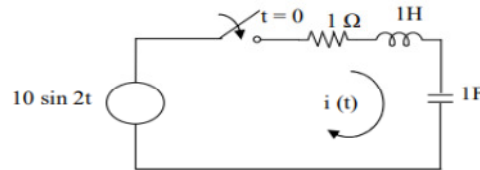

   b) A resistance R and 5μF capacitor are connected in series across a 100V dc supply. Calculate the value of R such that the voltage across the capacitor becomes 50V in 5s after the circuit is switched on.   **[7M]**

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UNIT-III

5   Find the current i(t) in the network shown in Figure 3 for t >0. At t = 0⁻ , the   [14M]
network was unenergized.


OR

6   a)   Derive the expression for current in a series RC circuit excited by a sinusoidal   [7M]
source V=Vm Sinωt
b)   A sinusoidal voltage V = 100 sin 314t is applied suddenly to a series RC circuit   [7M]
with R =15Ω and C = 5μ F. Assuming zero initial charging on capacitor.
Determine the expression of current i(t) in the circuit
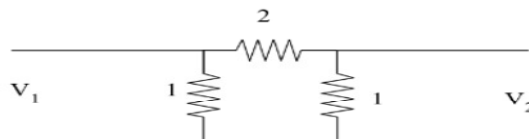
UNIT-IV

7   a)   Find the y-parameters for the network given in Figure below   [7M]
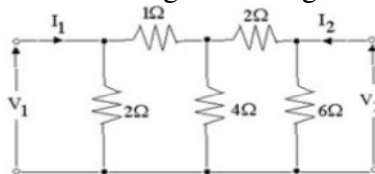
b)   The Z parameters of a two port net work are Z_{11} =10 Ω, Z_{22} = 20 Ω,   [7M]
Z_{12} = Z_{21} = 5Ω. Determine   i) The ABCD parameters of this network and
ii) Its equivalent   T network.

OR

8   a)   Find the Z and Y parameters of the given π- network. All values of resistance are   [7M]
in ohms

b)   The given Y-parameters are, Y_{11}= 0.5, Y_{12}= Y_{21}= 0.6, Y_{22}= 0.9. Find Impedance   [7M]
parameters.

UNIT-V

9   a)   Explain the design procedure of a band elimination filter.   [7M]
b)   Design a m-derived High Pass Filter with a cut-off frequency of 10 kHz. Design   [7M]
impedance of 550Ω and m = 0.5

OR

10   Determine the cut-off frequency and the nominal impedance of the low-pass   [14M]
filter sections shown in figure below.(In figure L= 100mH each, and C=0.2μF)

|'|'|'|||'|'|'|||'|