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## Sheet (6)

1. What are the functions of the following MATLAB commands:
  - (a) eval, polyval, roots, poly
  - (b) area, trapz
  - (c) conv, deconv, polyder
2. Using the polynomials  $A(x) = x^3 + 2x^2 - 4x - 7$ ,  $B(x) = 2x^2 - 4x - 7$ . Write a MATLAB program to estimate the following operations:

- $A(x) + B(x)$
- $A(x) B(x)$
- $\frac{A(x)}{B(x)}$
- $\frac{dA(x)}{dx}$
- $\frac{d[A(x)B(x)]}{dx}$
- $\frac{d[A(x)/B(x)]}{dx}$
- The roots of each polynomial

Finally draw these polynomials for  $x=1:10$  with step 0.01 then find the area under each curve.

3. Write the MATLAB program which will ask the user to input a number. The program should print out the square of that number if the number is a real number or print out zero if the entered number is a complex number .
4. Write a MATLAB program to ask the user to input a real number. The program should print out the square root of that number if the number is positive or print out zero if the entered number is negative.

5. Write a MATLAB program to plot the sinusoidal waveform  $A=10 \sin(\theta)$  where  $\theta$  are varied from 0 to  $4\pi$  with step 0.01. Then the program ask the user to input the coordinates of a two point on the plot to shade the area between them then print out these area.
6. Write a MATLAB program which will ask the user to input the capacitance of three capacitors connected in series. The program should print out the message “The equivalent capacitance of the three capacitors which are connected in series is” and then display the equivalent of them.
7. Write a MATLAB program which will ask the user to input the capacitance of three capacitors connected in parallel. The program should print out the message “The equivalent capacitance of the three capacitors which are connected in parallel is” and then display the equivalent of them.
8. A ring of mean diameter 21 cm and cross section area  $10 \text{ cm}^2$  is made up of semi circular sections of cast steel and cast iron. if each joint has reluctance equal to an airgap of 0.2 mm, Write a MATLAB program to tabulate the AT required to produce a flux varies from 0.1 to 0.8 mwb in the magnetic circuit, take  $\mu_r$  for steel and iron as 825 and 165 respectively. Neglect leakage and fringing.
9. The magnetic circuit made of wrought iron is arranged as shown in Fig.(1). The central limb has a length of 11 cm and cross sectional area of  $8 \text{ cm}^2$  and each of the side limb has a cross sectional area of  $5 \text{ cm}^2$ . Write a MATLAB program to print out the AT required to produce a flux of 1 mwb in the central limb, neglecting the magnetic leakage and fringing, the magnetization curve of wrought iron is given by:

B (wb/m <sup>2</sup> )	1	1.25	1.5
H (AT/m)	200	500	650

L3=34 cm

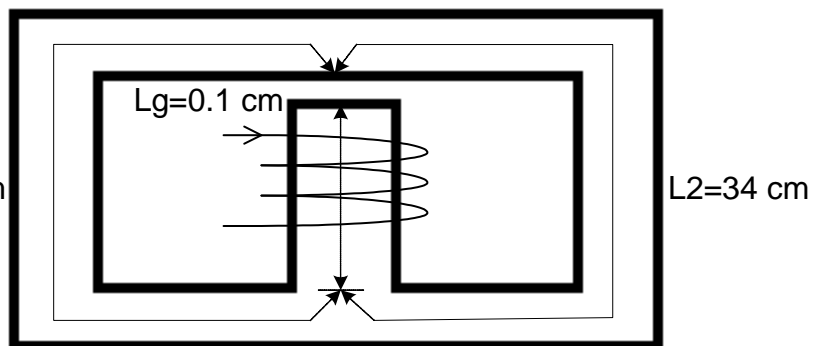


Fig.(1).

10. The relation between the resistance of copper and the temperature are governed by the following equation:

$$R_t = R_0(1 + \alpha_0 t) \quad \text{where } \alpha_0 = 1/234.5$$

Write a MATLAB Program to draw the copper resistance versus temperature, for  $R_0=100\Omega$ , where the temperature varies from  $-234.5$  to  $60 \text{ c}^\circ$  with a step of 0.01. Then

define the max. and min. values of the resistance by a red circle on the graph and write "max, min value" at these points. Also print out the values of temperature and resistance corresponding to index100.

11. A coil having a self-induction coefficient of 0.2 H and a winding resistance of 0.6Ω. The current in it increases from zero to 300A at the rate of 120A/s. Then remains constant at 300A for 2 s and then falls uniformly to zero in 2.5 s. Write a MATLAB Program to draw  $i$ ,  $V_R$ ,  $V_L$ ,  $V_{coil}$  in separate graphs at the same window when time varies from 0 to 7 s with step 0.001. Then call the different values of the current and voltages at 1, 3, 5 second also print out the index of the max. value of  $V_{coil}$ .
12. Assuming a supply voltage of 100 v applied on three series resistances, Write a MATLAB script ask the user to input the values of the three resistances, then estimate the power losses at each resistance. Also, using the program, prove that the summation of power losses at the resistances are equal to the power consumed from the supply.
13. Write a MATLAB Program to tabulate and plot the current, voltage and power to the resistor  $R_L$  of the network of Fig.(2) for a range of values for  $R_L$  from 1Ω to 20Ω. Print out the value of  $R_L$  that result in maximum power to  $R_L$ .

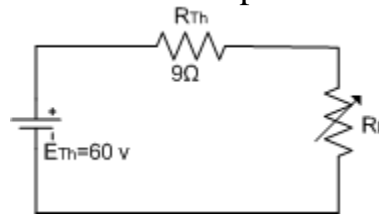


Fig.(2).

14. A supply voltage of 100 v is applied on three parallel resistances of 100, 150, 200Ω. Write a MATLAB Program to provide a complete solution of the parallel network and print out the total resistance, input current, current through each branch, and the power losses at each resistance.
15. Write a MATLAB Program ask the user to input ( $E_1$ ,  $E_2$ ,  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $R_6$ ) then determine the mesh currents  $i_1$ ,  $i_2$ ,  $i_3$  of the network of Fig.(3). Print out the current, voltage and power across  $R_3$ ,  $R_4$ , and  $R_6$ .

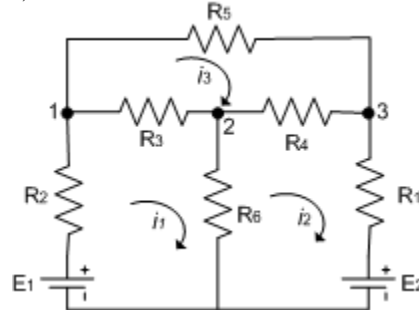
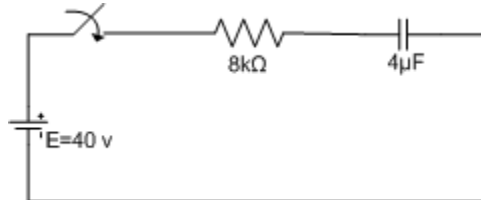


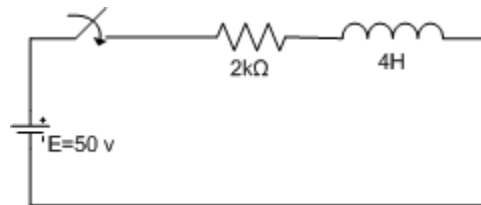
Fig.(3).

16. Write a MATLAB Program ask the user to input ( $E_1$ ,  $E_2$ ,  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $R_6$ ) then determine the nodal voltages of the network of Fig.(3) illustrating the maximum value. Print out the current, voltage and power across  $R_1$ ,  $R_2$ , and  $R_5$ .
17. Write a MATLAB Program to tabulate and plot the voltages ( $v_c$ ,  $v_R$ ) and the current  $i_c$  for the network of Fig.(4) for a five time constants after the switch is closed at  $t=0$  s. use an incremental step of  $(0.2\tau)$ . Print out the percentage of  $v_c$  at  $t=\tau$ .



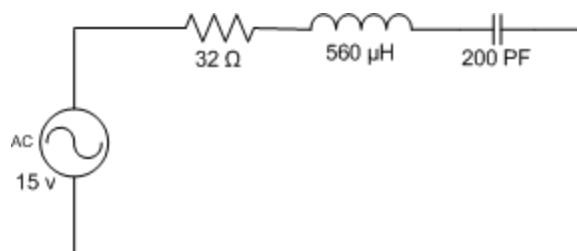
Fig(4)

18. Write a MATLAB Program to tabulate and plot the voltages ( $v_L$ ,  $v_R$ ) and the current  $i_L$  for the network of Fig.(5) for a five time constants after the switch is closed at  $t=0$  s. use an incremental step of  $(0.2\tau)$ . Print out the percentage of  $i_L$  at  $t=\tau$ .



Fig(5)

19. A sinusoidal supply voltage can be expressed by the equation  $v=V_m \sin(\omega t)$ . Write the MATLAB program that ask the user to enter the peak voltage and the supply frequency then plot the instantaneous voltage for  $t$  starts from 0 to 60 ms with step 0.01 ms. Also calculate the average, RMS values of the supply voltage finally compare the result with the values which can be determined from the predefined relations for the average and RMS values.
20. Referring to Fig.(6), Write a MATLAB Program to sketch the current, voltages ( $v_c$ ,  $v_L$ ,  $v_R$ ) and power ( $P_c$ ,  $P_L$ ,  $P_R$ ) waveforms for  $t$  varies from 0 to 60 ms with step 0.01 ms. From the graphs determine the average and RMS values of the current and the average power dissipation across the each element. Finally draw the phasor diagram of the circuit.
21. Referring to Fig.(6), Write a MATLAB Program to tabulate and sketch ( $R$ ,  $X_L$ ,  $X_C$ ,  $|Z|$ ,  $\theta_Z$ ,  $I$ ,  $V_c$ ,  $V_L$ ,  $V_R$ ) against the supply frequency (for a range from 100 kHz to 800 kHz with step 1Hz). Then print out the resonant frequency.



Fig(6)