Thapar Institute of Engineering and Technology (Deemed to be University)

DEPARTMENT OF ELECTRICAL AND INSTRUMENATION ENGINEERING

TUTORIAL 6 (DC TRANSIENTS)

UES 013 ELECTRICAL AND ELECTRONICS ENGINERING

FIRST YEAR (CSE) Course Instructor: Dr. Shakti Singh, Dr. Mohd. Asim

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1. A resistance R and 5 μF capacitor are connected in series across a 100 V d.c. supply. Calculate the value of R such that the voltage across the capacitor becomes 50 V in 5 seconds after the circuit is switched on.

   [Ans. $R = 1.45\times10^{6}\ \Omega$]

2. Find the value of $v_c(t)$ for t > 0 in the circuit shown in Fig. 1. Assume initial condition $v_c(0^-) = 9$ V.

   [Ans. $v_c(t) = 1 + 8e^{-4t}$ V]

3. The 12 V battery in Fig. 2 is disconnected (opened) at t = 0. Find the inductor current and voltage as a function of time.

   [Ans. $3e^{-100t}$ A, $-30e^{-100t}$ V]

4. In Fig. 3, the switch S is closed. Find the time when the current from the battery reaches to 300 mA.

   [Ans. 2.1msec.]

5. Consider the R-L series circuit shown in Fig. 4 with R = 5 Ω, L = 1 H, V_s = 48 V.
   Determine (a) the expression $i(t)$, $V_L(t)$, $V_R(t)$ and di/dt for t ≥ 0; (b) di/dt at $t = 0^+$; (c) the time at which $V_R = V_L$; (d) the resistance is decreased from 5 Ω to 4 Ω at time t = 0.5 sec., determine i(t).

   [Ans. (a) 9.6 ($1-e^{-5t}$) A, $48e^{-5t}$ V, 48 ($1-e^{-5t}$) V, $48e^{-5t}$ A/sec., (b), 48 A/sec., (c) 0.1386 sec., (d) $12-3.188e^{-4t}$ A]

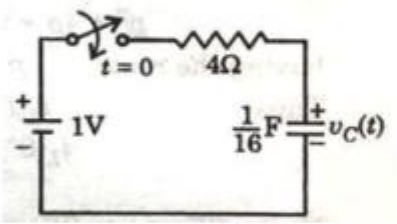

Fig. 1

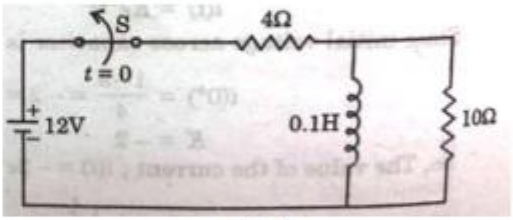

Fig. 2

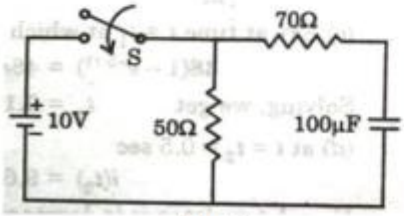

Fig. 3

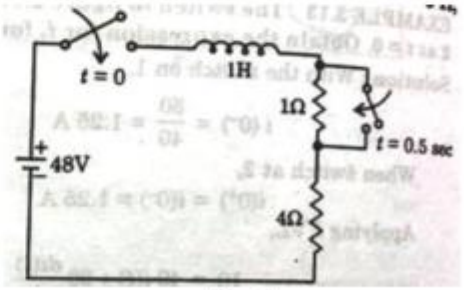

Fig. 4

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DEPARTMENT OF ELECTRICAL AND INSTRUMENATION ENGINEERING

TUTORIAL 7 & 8 (AC CIRCUITS)

UES 013 ELECTRICAL AND ELECTRONICS ENGINERING

FIRST YEAR (CSE) Course Instructor: Dr. Shakti Singh, Dr. Mohd. Asim

Q1. A sinusoidal alternating current of frequency 25Hz has a maximum value of 100A. How long will it take for the current to attain values of 20, 50 and 100A?

(.00128s,.0033s,0.01s)

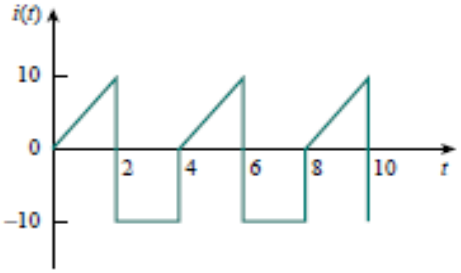

Figure 1

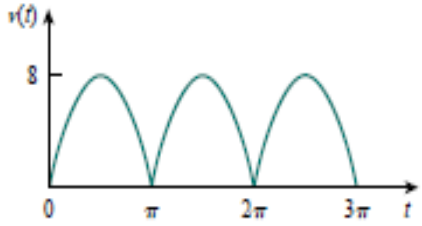

Figure 2

Q2. Determine the rms value of the current waveform in Fig. 1. If the current is passed through a 2Ω resistor, find the average power absorbed by the resistor. ***(8.165A, 133.5W)***

Q3. Find the rms value of the full-wave rectified sine wave in Fig. 2. Calculate the average power dissipated in a 6 Ω resistor. ***(5.657 V, 5.334 W)***

Q4. A resultant current wave is made of two components; direct current of 10A and sinusoidal alternating current of 50Hz, with peak value of 10A.

(i) Draw the resultant current wave

(ii) Write down an expression for the resultant current wave, taking t=0 at a point where the ac component is zero and a rising in a positive direction .

(iii)Calculate the average valve of current of the resultant wave over a one complete cycle.

(iv)Determine the rms value of current of the resultant wave. ***(10A, 12.25A)***

Q5. A voltage of 120 V at 50 Hz is applied to a resistance, R in series with a capacitance, C. The current drawn is 2 A, and the power loss in the resistance is 100 W. Calculate the resistance and the Capacitance. ***(25Ω, 58.36μF)***

Q6. Find the current that flow through a coil of negligible resistance and inductance of 60mH, when connected to 230V, 50Hz single phase supply. What will be current if the frequency is

(a) Decreased to 20Hz

(b) Increased to 60Hz.

(c) Increased to 100Hz. ***(12.2A, 30.49A,10.16A,6.1A***)

Q5.Use Phasors find the sum of two sinusoidal given by 40sin314t and 30cos (314t-∏/4)

Q6.A resistance of 20Ω, an inductance of 0.2H and a capacitance of 100μF are connected in series across a 220V, 50Hz supply .Determine the

(i) Impedance

(ii) Current

(iii)Voltage across R,L and C

(iv) Power factor
(v) Active and apparent power

Q7. A series circuit consists of R=10Ω, L=0.1H, C= 8μF, Determine the frequency at resonance, Q factor at resonance and half power frequencies. (178Hz, 11.18, 170Hz, 186Hz)

Q8.A coil A takes 2 A at power factor of 0.8 lagging with an applied potential difference of 10V. A second coil B takes 2A with a power factor of 0.7 lagging with an applied voltage of 5 V. What voltage will be required to produce a total current of 2A with the coils A and B in series? Also find out power factor in this case. (14.96V, 0.77lagging)

Q9.A inductive coil of resistance 10ohm and inductance of 0.04H is connected in parallel with a non inductive resistor of 25Ω. The combination is connected across a 230V, 50 Hz mains. Calculate
(i) Current in each branch and its angle of lag or lead
(ii) Total current drawn by the circuit
(iii) Phase angle of the combination and power factor

Q10. A resistor of 30ohm and a capacitor of unknown value are connected in parallel across an 110V, 50 Hz supply. The combination draws a current of 5A from the supply.
Find the value of unknown capacitance (98.26μF)

Q11.Three inductive coils, each with a resistance of 15 ohm and an inductance of 0.03H are connected in (a) star and (b) delta, to a 3 phase supply of 400V. 50Hz supply .Calculate for each of the above case

(i)	Phase current	***(13A,22.6A)***
(ii)	Line current	***(13A,39.14A)***
(iii)	Total power absorbed	***(7.632W, 22968W***)

Q12. A balanced mesh connected load of (8+j6) ohm per phase is connected to a 3 phase, 50Hz, 230V supply system. Calculate

(i)	Line current	
(ii)	Power factor	
(iii)	Power	
(iv)	Total volt ampere	***(40A, 0.8, 12.7kW, 15.9kVA)***

Q13. Two wattmeter connected to measure the power input to a 3 phase circuit indicate 15 and 1.5kW respectively. The latter reading being obtained after reversing the current coil connection. Calculate the power and power factor of the load. ***(13.5W, .427)***

Q14. A balanced star connected load is supplied from a symmetrical, 3 phase, 440V, 50Hz supply system. The current in each phase is 20 A and lags behind its phase voltage by an angle of 40, calculate

(i)	Phase voltage
(ii)	Load parameter
(iii)	Total power
(iv)	Reading of two wattmeter, connected in load circuit to measure total power.

(254V, R=9.73, X=8.16, 11.6745, W1= 8.665 kW, W2=3.009kW)

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DEPARTMENT OF ELECTRICAL AND INSTRUMENATION ENGINEERING

TUTORIAL 9 (Measurement and Op-Amp)

UES 013 ELECTRICAL AND ELECTRONICS ENGINERING

FIRST YEAR (CSE) **Course Instructor: Dr. Shakti Singh**

Q1. What are the essential components of a measurement system? Explain with a neat diagram

Q2. Definer the following terms, accuracy, resolution, span, dead zone and sensitivity in items of measuring instruments

Q3. What are Deflecting torque, controlling torque, and damping torque.

Q4. What are the PMMC instruments? Explain

Q5. What is an ideal Op-amp? What are different applications of the op-amp?

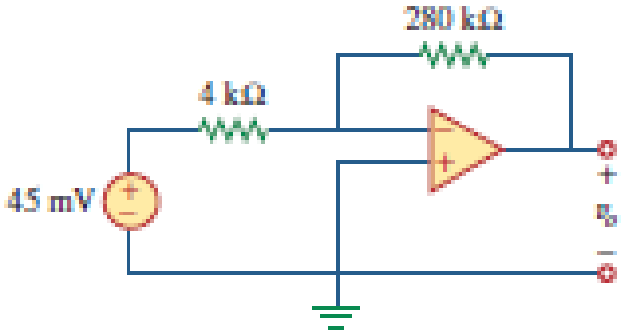

Fig.1

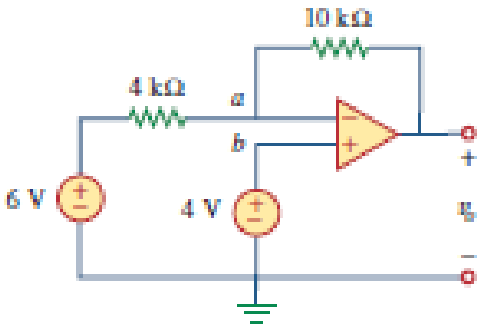

Fig.2

Q6. Find the output voltage v_o as shown in figure 1. Also, calculate the current thorough the feedback resistor.

Q7. For the Op-amp circuit as shown in figure 2, calculate the output voltage.

Q8. Find v_o and i_o of op-amp circuit as shown in figure 3.

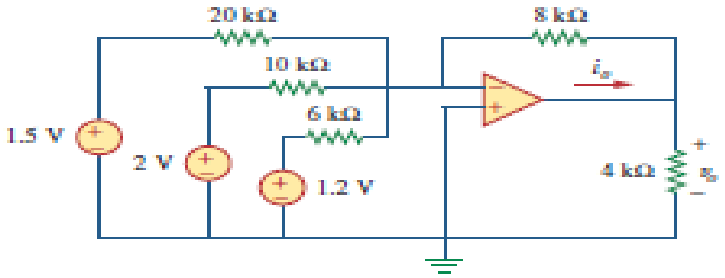

Fig.3