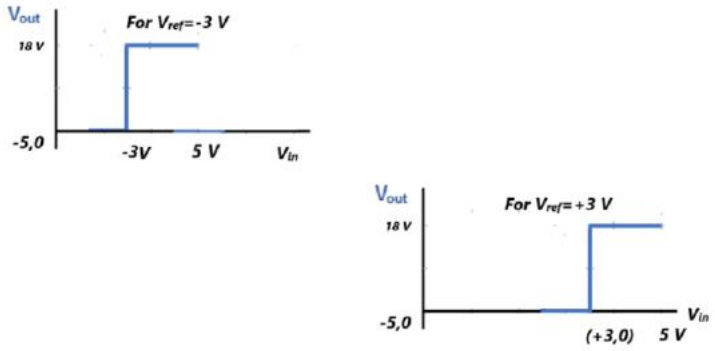
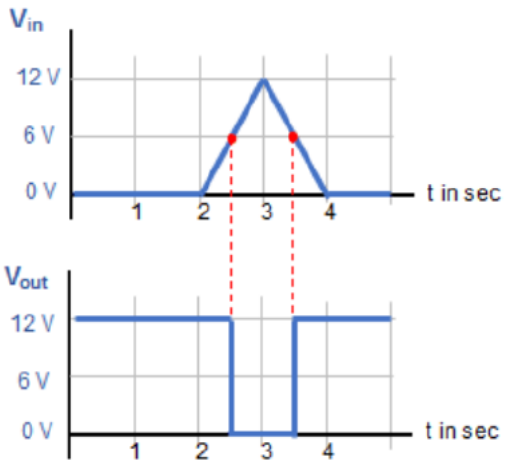
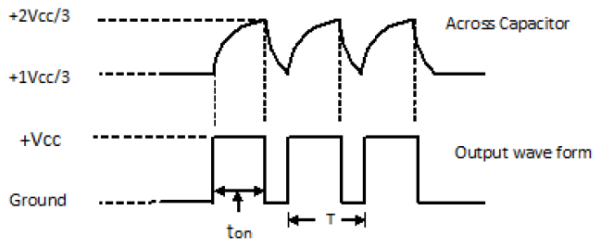
Answers of Assignment 9-10-12

Q.	Answers of Assignment-9
1	
2	Given +Vcc=12 V and -Vcc=0 V and R_1 =R_2, therefore V_{ref}= Vcc/2=6 V 
3	**f=5.64 kHz, Duty Cycle= 59.5 %**
	
	With Control Pin-5 kept at 2.8 V DC:

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	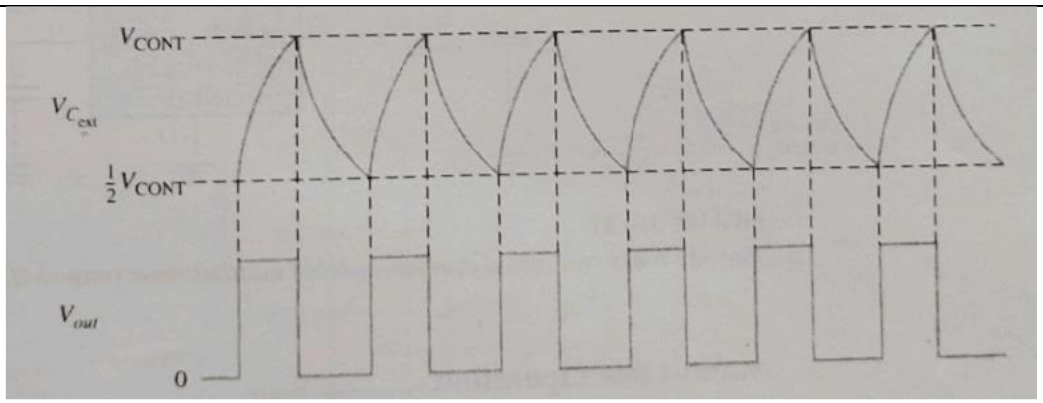 t_{on}= 0.418 *(R_A+R_B)C, t_{off}=R_BC ln(2)=0.69 R_BC
4	Pulse width= 1.1 ms
	Answer of Assignment-10
1	a. 104 Ohm, Z_T= 342.11 Ohm, b. I_C= $16.45\ \text{mA}\angle 90°$, c. I_L= $16.78\ \text{mA}\angle -78.69°$ d. $795.77\ \mu\text{H}$, $76.52\ \text{nF}$ e. Qp=3.29, BW=6079.03 Hz
2.	i. R=30.67 Ohm, ii. L=50.72 mH, iii. Q=10.38
3.	a. 3.91 mH, b. X_L=X_C=44.2 ohm, c. I_{rms}= 3.01 mA, d. 42.58 micro W, e. 42.58 micro VA, f. 1, g. Qs= 9.4 , BW= 191.49 Hz.
4.	$Z_L = 0.72\ \Omega - j\ 5.46\ \Omega$, P_{max}= 25.32 W
	Answers of Assignment-12
1.	a. $\lvert H(j\omega)\rvert = 0.05\omega / \sqrt{[1+ (0.1\omega)^2]}$ and $\theta = 90° - \tan^{-1}(0.1\omega)$.
	b. $\lvert H(j\omega_x)\rvert = 1/2\sqrt{2}$ and $\theta_x = 45°$.
	c. $\lvert H(j\omega)\rvert_{\omega\to 0} = 0.05\omega \Rightarrow$ 6 dB/octave, and $\lvert H(j\omega)\rvert_{\omega\to\infty} = 0.5 \Rightarrow$ flat.
	d. **High pass** characteristic with $\lvert H(j\omega)\rvert_{flat} = 0.5$.
2.	a. $\Rightarrow \lvert H(j\omega)\rvert = 1/\sqrt{[\{1 + 2000(1 - 10^{-6}\omega^2)\}^2 + (0.09\omega)^2]}$ and $\theta = -\tan^{-1}[(0.09\ \omega)/\{1 + 2000(1 - 10^{-6}\omega^2)\}]$.
	b. $\omega_x = 1000 \Rightarrow \lvert H(j\omega_x)\rvert \cong 1/90$ and $\theta_x \cong 90°$.
	c. $\lvert H(j\omega)\rvert_{\omega\to 0} \cong 0.0005 \Rightarrow$ flat but very low level, and $\lvert H(j\omega)\rvert_{\omega\to\infty} = 500/\omega^2 \Rightarrow -12$ dB/octave.
	d. **Band pass** characteristic with centre frequency ω_x because $\lvert H(j\omega_x)\rvert >> 0.0005$ (flat level).
3.	a. $\Rightarrow \lvert H(j\omega)\rvert = 1/\sqrt{[(1- 0.0001\omega^2)^2 + 0.0009\omega^2]}$ and $\theta = -\tan^{-1}[0.03\omega/(1 - 0.0001\omega^2)]$.
	b. $\omega_x = 100 \Rightarrow \lvert H(j\omega_x)\rvert = 1/3$ and $\theta_x = -90°$.

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	c. $\lvert H(j\omega)\rvert_{\omega\to 0} = 1 \Rightarrow$ flat and $\lvert H(j\omega)\rvert_{\omega\to\infty} = 10^4/\omega^2 \Rightarrow -12$ dB/octave.
	d. **Low pass** characteristic with $\lvert H(j\omega)\rvert_{flat} = 1$.
4.	$f = \frac{1}{2\pi RC\sqrt{6}} \Rightarrow C = \frac{1}{2\pi Rf\sqrt{6}} = \frac{1}{2\pi 10k \times 1k\sqrt{6}} = \underline{\underline{6.5nF}}$
	$\lvert A\rvert = \frac{R_f}{R_i} \geq 29 \Rightarrow R_f \geq 29R_i$ **=290 k-ohm**
5.	$f = \frac{1}{2\pi\sqrt{R_1C_1R_2C_2}} \Rightarrow f^2 = \frac{1}{4\pi^2 R_1C_1R_2C_2}$ Frequency of oscillation $R_1C_1 = \frac{1}{4\pi^2 f^2 R_2C_2} = \frac{1}{4\pi^2(1k)^2 10k \times 0.1\mu} = 0.025ms \Rightarrow C_1 = \frac{0.025ms}{R_1}$ **.....(1)** $\frac{R_3}{R_4} = \frac{R_1}{R_2} + \frac{C_2}{C_1} \Rightarrow \frac{10k}{1k} = \frac{R_1}{10k} + \frac{0.1\mu F}{0.025ms} \Rightarrow \frac{R_1}{10k} = 10 - \frac{0.1}{25}$ **x R_1** = $R_1 =$ **2.439 k-ohm** **(1)=>** $C_1 = \frac{0.025ms}{2.439\text{ k-ohm}} =$ **0.01 uF** Condition of oscillation