CAIRO UNIVERSITY		ELECTRONICS AND COMMUNICATION DEPT.
FACULTY OF ENGINEERING		2^{nd} Year
	ELECTRIC CIRUITS	SHEET (7)

[1]Find the Exponential Fourier Series representation for the signal $f(t)=2t$ over the interval (0,1) .

[2]Represent the signal $f(t) = e^{-t}$ over the interval (0,1) using :

a)The Exponential Fourier Series .

b)The Tregonometric Fourier Series .

Compare your results .

[3]Find the Exponential and Tregonometric Fourier Series representation for :

a)The symmetric square wave shown in Fig.1 .

b)The waveform shown in Fig.2 .

[4]Determine the average power of the signal $f(t) = 2\cos(200t)$ and draw its single and double-sided amplitude and phase spectra .

[5]A periodic gate signal , $f(t)$, is applied to the input of a system having the transfer function shown in Fig.3 . If the input signal is given by :

$$f(t) = \sum_{n=-\infty}^{\infty} (A\tau/T)\ |\ \sin(n\omega_0\tau/2)\ /\ (n\omega_0\tau/2)\ |\ e^{jn\omega_0 t}$$

Where τ is the pulse width and T is the period of the signal .Calculate the output of the System .

[6]The system $H(\omega) = -\omega^2/(1+\omega^2)$ is used to filter the signal shown in Fig.4 . Determine the series expression for the output signal and calculate the output power contained in the first three components .

[7]A given amplifier is tested with a sinusoidal input signal of 500 Hz having 2mV peak amplitude . If the output was found to be the symmetrical square wave with unit peak amplitude shown in Fig.1 . Calculate the Total Harmonic Distortion (T.H.D.) and the Linear Gain of the amplifier .

[8]The output of a simple rectifier circuit with a smoothing capacitor and a resistive load is shown in Fig.5 :

a)Find the Exponential Fourier Series for this waveform .

b)Sketch its amplitude and phase spectra (for $n \le 5$) .

c)Calculate the percentage of the total average power contained in the fundamental .

[9] A voltage signal $v(t)$ supplies a circuit containing a series connection of a resistance R of 100Ω, a coil L of 0.5H and a condenser C of $12.5\mu F$. If the voltage signal is :

$v(t) = 100\sin(200t) + 50\sin(400t) + 30\sin(600t)$ V

a) Calculate the expression of the current in the time domain $i(t)$.

b) Sketch the amplitude and phase spectra of the current.

c) Find the effective values of the current and voltage.

[10] The single-sided amplitude and phase spectra of a periodic function $f(t)$ are shown in Fig.6a,b. Determine the time domain expression of the function if T=0.1 sec and sketch its double-sided amplitude and phase spectra.

[11] Determine and sketch the first four terms of the amplitude and phase spectra of the periodic voltage signal given by :

$v(t) = (1-t^2) \qquad -1 \le t \le 1$

[12] The current in a 10mH inductance has the waveform shown in Fig.7. Obtain the Trigonometric Fourier Series of the voltage across the inductance given that $\omega = 500$ rad./sec. Sketch the voltage waveform.

[13] A voltage signal $v(t)$ is applied to the terminals of a passive network resulting in a current $i(t)$. If the current and voltage are given by :

$v(t) = 50 + 25\sin(500t) + 10\sin(1500t) + 5\sin(2500t)$ V

$i(t) = 5 + 2.23\sin(500t-26.6^o) + 0.556\sin(1500t-56.3^o) + 0.186\sin(2500t-68.2^o)$ A

Calculate the effective values of the voltage and current and the average power dessipated in the network.

[14] Determine the steady state response of the current $i_o(t)$ in the circuit shown in Fig.8a if the input voltage of the circuit $v(t)$ is described by the waveform shown in Fig.8b.

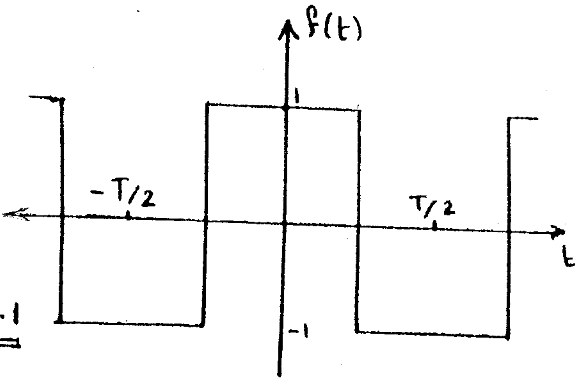


Fig.1

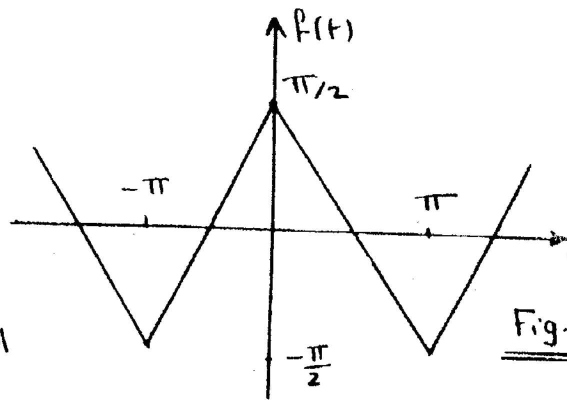


Fig.2

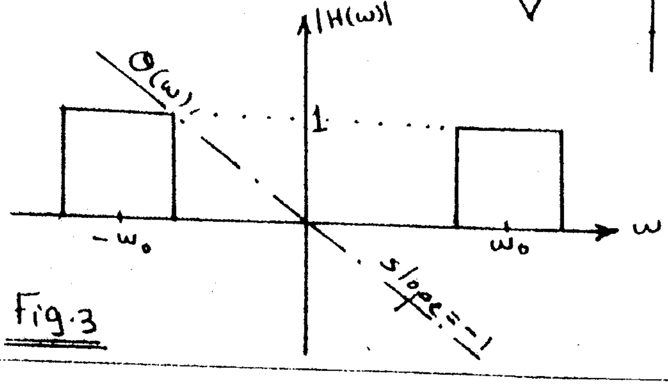


Fig.3

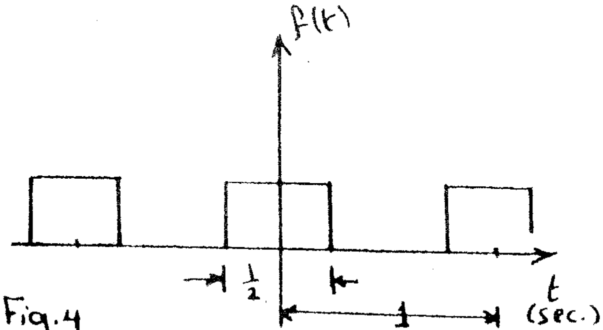


Fig.4

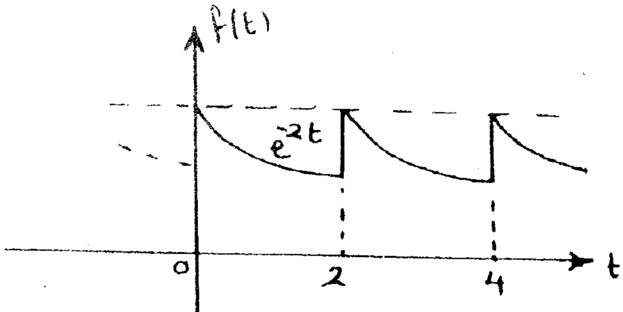


Fig.5

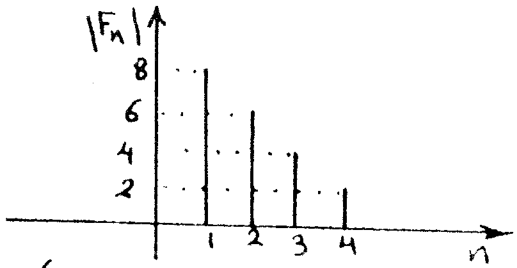


Fig.6a

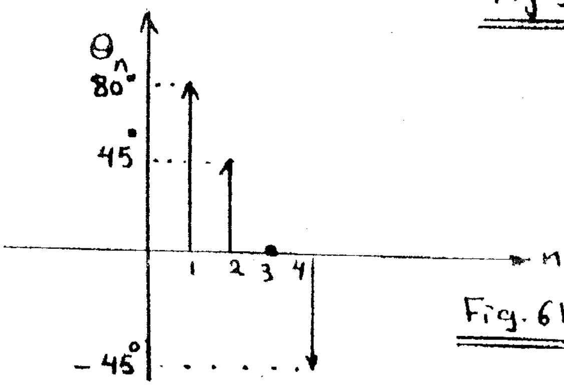
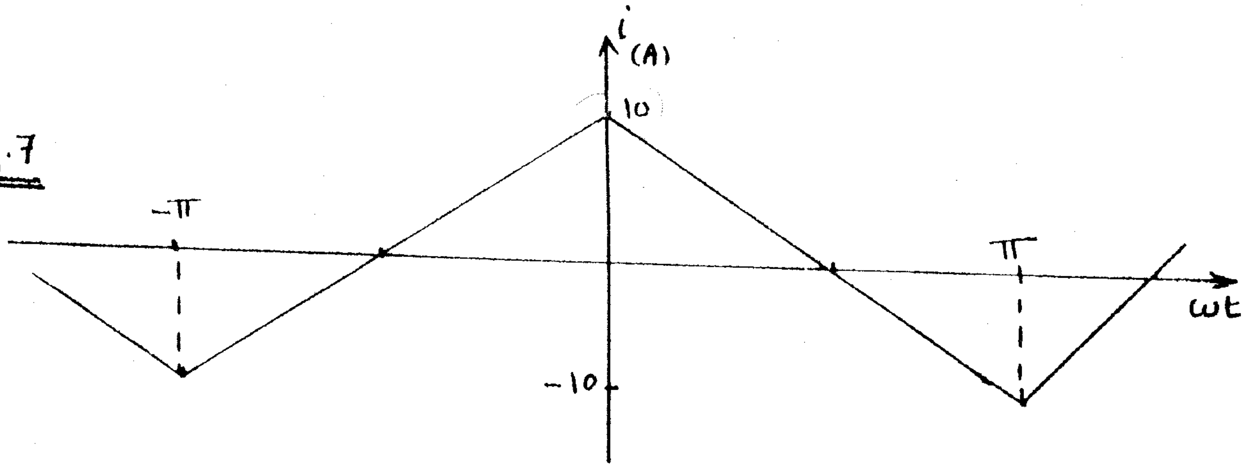


Fig.6b

Fig.7



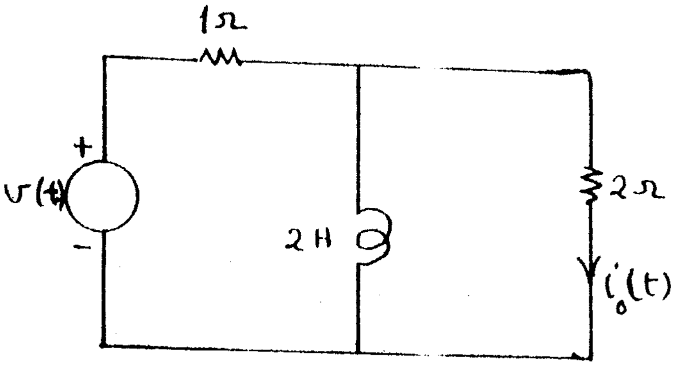


Fig.8a

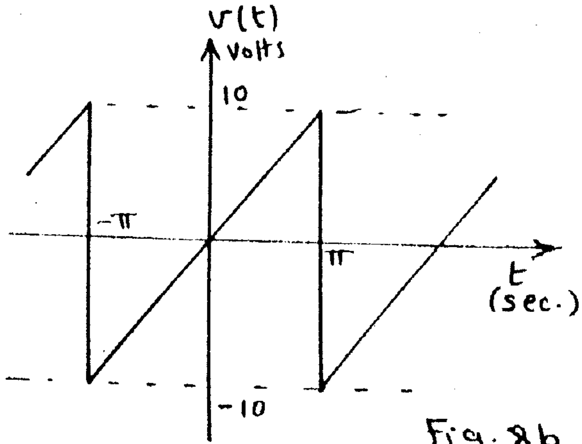


Fig.8b

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