



MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY ALLAHABAD
Department of Electronics & Communication Engineering
End-Semester Examination (Even Sem 2016-17)
B. Tech. IV Semester (EC-1405)
Course: Communication Foundations

Max Marks: 60

Time: 3.00 Hours

Note: Attempt any SIX questions. Assume suitable data if required.

- Q.1, (a) Find the energy of the signal shown in Fig. 1(a). Comment on the energy of the signal for its (i) sign change, (ii) time shift, and (iii) doubling of the signal. What is the effect if the signal is multiplied by k (constant). 5

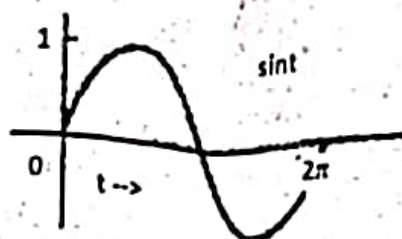


Fig. 1(a)

- (b) Find the power of the periodic signal $g(t)$, shown in Fig. 1(b). Find also the power and r.m.s. values of (i) $-g(t)$ (ii) $2g(t)$ (iii) $cg(t)$, where c is a constant. 5

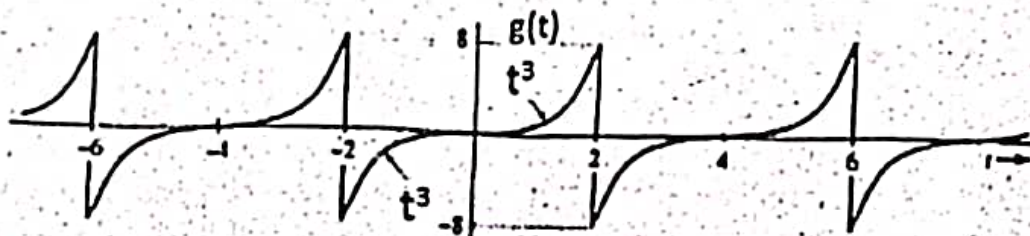


Fig. 1(b)

- Q.2, (a) Find the exponential Fourier series and sketch amplitude and phase spectra for the following periodic signal shown in Fig. 2(a). 5

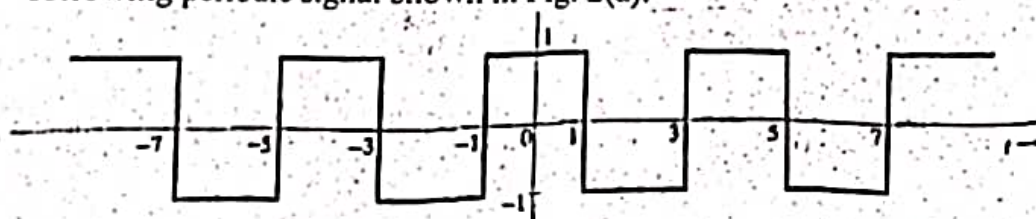


Fig. 2(a)

- (b) The equation of an angle modulated voltage is $v = 10\sin(10^8 t + 3\sin 10^4 t)$. What form of angle modulation is this? Calculate the carrier and modulating frequencies, the modulation index, deviation, and the power radiated in a $100\text{-}\Omega$ resistor. 5

Q.3. (a) Define AM, its modulation index and derive an expression for AM waveform in terms of modulation index. Explain with suitable block diagram, generation and demodulation of AM. 5

(b) Derive an expression for single tone FM in terms of β . What is minimum and maximum phase deviation? Draw block diagram for conversion from PM to FM and vice versa. Explain generation of single tone FM using any one method. 5

Q.4. (a) Find the Fourier Transform of $g(t)$, given by

$$g(t) = \begin{cases} 1 & -1 < t \leq 0 \\ 2 & 0 < t \leq 1 \\ 1 & 1 < t \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

Also, find Fourier Transform of $g(t-1)$. 5

(b) If $g_{12}(t) = g_1(t) * g_2(t)$, show that $\frac{dg_{12}(t)}{dt} = g_1(t) * \frac{dg_2(t)}{dt} = \frac{dg_1(t)}{dt} * g_2(t)$, by using convolution and differentiation properties of Fourier Transform. 5

Q.5. (a) Explain each step with suitable examples the analog to digital conversion of a signal. 5

(b) A PCM uses a uniform quantizer followed by 7-bit binary encoder. The bit rate of the system is equal to 50×10^6 bits/sec. What is the minimum message bandwidth for which the system operates satisfactorily? 5

Q.6. (a) Explain the advantages of digital modulation schemes over analog modulation. Explain modulation and demodulation of PSK. Also, compare the ASK, FSK and PSK modulations. 5

(b) Explain pulse analog modulation techniques and write their applications. 5

Q.7. Write short notes on any FOUR of the following: 2.5x4

- Super heterodyne receiver
- Ground wave, sky wave and space wave propagations
- Properties of Fourier integrals
- Nyquist criterion for sampling
- Types of signals and systems