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Total Number of Pages: 02

B.Tech.
PCEC43025th Semester Back Examination 2017-18

Analog Communication Techniques

BRANCH: ECE, ETC

Time: 3 Hours

Max Marks: 70

Q.CODE: B237

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

- Q1 Answer the following questions : (2x10)**
- What are the fundamental limitations of a communication system?
 - Let $x(t) \leftrightarrow X(j\omega)$ be Fourier transform pair. Then find the Fourier transform of the signal $x(5t-3)$ in terms of $X(j\omega)$.
 - Draw the Amplitude spectrum of a rectangular pulse of width '2T'.
 - Prove that the convolution of a function $x(t)$ with an unit impulse function results the function itself.
 - A signal $m(t)$ with bandwidth 500 Hz is first multiplied by a signal $g(t)$ where $g(t) = \sum_{R=-\infty}^{\infty} (-1)^k \delta(t - 0.5 \times 10^{-4}k)$. The resulting signal is then passed through an ideal low pass filter with bandwidth 1 kHz. Find the output of the low pass filter.
 - A message signal described as $\cos 200\pi t + 4 \cos \pi t$ modulates a carrier $\cos 2\pi f_c t$ where $f_c = 1\text{MHz}$ to produce an AM signal. For demodulating the generated AM signal using the envelop detector, what should be the range of time constant?
 - Find the conventional AM signal without over modulation where the message signal is $2\cos 2\pi f_m t$ and the carrier is $A_c \cos 2\pi f_c t$.
 - Calculate the average power of $x(t)$ for the angle modulated signal $x(t) = 6 \cos [2\pi 10^6 t + 2 \sin(8000\pi t) + 4 \cos 8000\pi t]V$.
 - What is noise bandwidth?
 - Define SNR and give its significance.
- Q2**
- For a system the impulse response $h(t)$ is given as $h(t) = e^{-t}u(t) + e^{2t}u(-t)$. The system is excited by $x(t) = e^{-2t}u(t)$. Find the output $y(t)$ for this system. (5)
 - State and discuss Parseval's theorem for Energy signal. Also define Energy spectral density. (5)
- Q3**
- Discusses the single tone Amplitude modulation with $m(t) = \cos 2\pi f_m t$ and $c(t) = \cos 2\pi f_c t$. Also calculate the power content in the AM wave. (5)
 - Discuss the Synchronous Detection method in detail of DSBSC with frequency spectrum. What are the disadvantages associate to it? (5)
- Q4**
- Discusses the VSB communication with generation and detection. Explain the effectiveness of VSB in TV transmission. (5)
 - A carrier wave of frequency 1GHz and amplitude 3 volt is frequency modulated by a sinusoidal modulating signal frequency of 500 Hz and of peak amplitude 1 volt. The frequency deviation Δf 1KHz. The level of modulating wave form is changed to 5volt peak and the modulating frequency is changed to 2KHz. Obtain the expression for the new modulated wave form. (5)

- Q5** a) Discuss the varactor diode method for FM generation with message signal as $m(t) = A_m \cos 2\pi f_m t$. Also state the limitation of it. **(5)**
- b) Given a frequency multiplier circuit and an NBFM signal as $x_{NBFM} = A \cos(\omega_c t + \beta \sin \omega_m t)$, with $\beta < 0.5$ and $f_c = 200$ KHz. Let f_m range from 50 Hz to 150 KHz, and let the maximum frequency deviation Δf at the output be 75 KHz. Determine the required frequency multiplication n and the maximum allowed frequency deviation at the input. **(5)**
- Q6** a) Discuss the PLL demodulation method in detail with mathematics to find message signal. **(5)**
- b) Determine whether the function given by expression **(5)**
- $$f_x(x) = \begin{cases} 0 & \text{for } x < 2 \\ \frac{1}{18}(3 + 2x) & \text{for } 2 \leq x \leq 4 \\ 0 & \text{for } x > 4 \end{cases}$$
- is a density function?
- Q7** Give the noise analysis for DSBFC signal to find SNR. Also find the figure of merit. **(10)**
- Q8** **Write short notes on any TWO :** **(5 x 2)**
- a) Rayleigh Distribution.
 - b) Frequency Division Multiplexing.
 - c) Envelop detection.
 - d) Equivalent Noise Bandwidth.