

**B.Tech. – VIEP – ELECTRONICS AND
COMMUNICATION ENGINEERING
(BTECVI)**

00303

Term-End Examination

June, 2018

BIEL-014 : ANALOG COMMUNICATION

Time : 3 hours

Maximum Marks : 70

Note : Attempt any *seven* questions. All questions carry equal marks. Use of scientific calculator is allowed.

1. (a) Explain and distinguish between auto-correlation and cross-correlation functions. 5
- (b) Explain the properties of Gaussian random process. 5
2. (a) Explain the central limit theorem. 2
- (b) Differentiate between signal energy and signal power. 3
- (c) Describe the classification of signals with suitable waveform and its corresponding expression. 5

3. (a) What is amplitude modulation ? Explain with suitable example. 2
- (b) How do you generate AM waves ? Explain any one technique. 4
- (c) How do you detect AM waves ? Explain any one technique. 4
4. (a) What is single-sideband modulation ? Explain with a technique how to obtain SSB modulation. 5
- (b) How do you detect SSB signals with a carrier ? Explain with the help of SSB modulation systems. 5
5. (a) Explain the generation principle of vestigial side-band modulation (VSB). 5
- (b) The carrier frequency of a certain VSB signal is $f_c = 20$ kHz, and the baseband signal bandwidth is 6 kHz. The VSB shaping filter $H_i(f)$ of the input, which cuts off the lower sideband gradually over 2 kHz. Find the output filter $H_o(f)$ required for distortionless reception. 5

6. For the baseband signal

$$4 \times 2 \frac{1}{2} = 10$$

$$m(t) = 2 \cos 1000 \pi t + \sin 2000 \pi t$$

do the following :

- (a) Sketch the spectrum of $m(t)$.
- (b) Sketch the spectrum of the DSB-SC signal $m(t) \cos 10,000 \pi t$.
- (c) Identify the upper sideband (USB) and lower sideband (LSB) spectra.
- (d) Identify the frequencies in the baseband, and the corresponding frequencies in the DSB-SC, USB and LSB spectra. Explain the nature of frequency shifting in each case.

7. (a) Write the basic definitions of FM. 2

(b) Differentiate between narrow band FM and wide band FM. 4

(c) Describe in detail, phase-locked loop. 4

8. (a) Describe the operation principle of FM stereo multiplexing. $2 \frac{1}{2}$

(b) What are the non-linear effects in FM systems ? $2 \frac{1}{2}$

- (c) An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is described by the equation 5

$$\phi_{\text{FM}}(t) =$$

$$10 \cos(\omega_c t + 5 \sin 3000 t + 10 \sin 2000 \pi t)$$

- (i) Find the power of the modulated signal.
- (ii) Find the frequency deviation ' Δf '.
- (iii) Find the deviation ratio ' β '.
- (iv) Find the phase deviation $\Delta\phi$.
- (v) Estimate the bandwidth of $\phi_{\text{FM}}(t)$
9. (a) What are the types of noise introduced in communication systems ? Briefly explain each one of them. 5
- (b) What is the use of pre-emphasis and de-emphasis circuit system in FM ? Explain with their circuits. 5

10. Write short notes on any *two* of the following : $2 \times 5 = 10$

- (a) Noise Figure and Noise-bandwidth
- (b) Non-linear model of PLL
- (c) Hilbert transform and its applications