

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

00549 Term-End Examination

December, 2017

BIEL-014 : ANALOG COMMUNICATION

Time : 3 hours

Maximum Marks : 70

Note : Answer any **five** questions. All questions carry equal marks. Missing data, if any, may be suitably assumed. Use of scientific calculator is permitted.

1. (a) Derive and explain mathematically the concept of probability density function and cumulative distribution function for a random variable. 7
- (b) A continuous random variable X is uniformly distributed in an interval of [0, 10]. Plot $f_X(x)$ and $F_X(x)$ i.e., PDF and CDF. 7
2. (a) Compare wideband and narrowband FM. Also derive the expression for narrowband FM wave. 7

- (b) Write the advantages and drawbacks of AM and FM signals and their applications in the real life scenario. 7
3. Explain the working of synchronous detector used for AM demodulation. What are the drawbacks of using this method ? Support your answer with mathematical analysis. 14
4. An AM signal is given by
- $$S(t) = [20 + 12 \cos 2\pi \times 10^4 t + 16 \cos 4\pi \times 10^4 t] \cos 2\pi \times 10^6 t.$$
- (a) Find bandwidth, power and power efficiency of the signal.
- (b) Find the frequency component of the AM signal and plot its spectrum. 2×7=14
5. (a) Explain the concept of frequency division multiplexing in detail with significance of guard band. 7
- (b) Ten message signals, each band limited to 20 kHz, are multiplexed using FDM, guard band is 0.5 kHz. Find the multiplexed signal bandwidth if modulation scheme used is AM, DSB and SSB. 7
6. Explain the concept of Phase-Locked Loop. How is it used to generate FM signal ? 14

7. Define the following :

7×2=14

- (a) Heterodyning
- (b) Modulation index for AM and FM
- (c) Dynamic range
- (d) Insertion loss
- (e) Sensitivity
- (f) Autocorrelation function
- (g) Central limit theorem

8. Write short notes on any *two* of the following :

2×7=14

- (a) Hilbert Transform
 - (b) Costas Loop
 - (c) Pre-emphasis and De-emphasis
-