

Bihar Engineering University, Patna

End Semester Examination - 2022

Course: B.Tech.

Semester: V

Time: 03 Hours

Code: 110501

Subject: Analog & Digital Communication system

Full Marks: 70

Instructions:-

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

Q.1 Choose the correct option/answer of the following (Any seven question only): [2 x 7 = 14]

- (a) The minimum channel Bandwidth is used by which modulation technique?
 - (i) VSB
 - (ii) SSB-SC
 - (iii) DSB-SC
 - (iv) AM
- (b) The frequency range of the modulating signal in an AM system is typically:
 - (i) Low frequency (<20 Hz)
 - (ii) Audio frequency(20 Hz-20 kHz)
 - (iii) Radio frequency (100 kHz-100 MHz)
 - (iv) Microwave frequency (>1 GHz)
- (c) The Carson's rule is used to calculate the bandwidth of an FM signal and is given by:
 - (i) Bandwidth = 2 x (deviation frequency + modulating frequency)
 - (ii) Bandwidth = 2 x (deviation frequency + 2 x modulating frequency)
 - (iii) Bandwidth = 2 x (deviation frequency + 3 x modulating frequency)
 - (iv) Bandwidth = 2 x (deviation frequency - modulating frequency)
- (d) What is the key difference between frequency modulation (FM) and phase modulation (PM)
 - (i) FM changes the frequency of the carrier, while PM changes the frequency of the carrier.
 - (ii) FM changes the phase of the carrier, while PM changes the frequency of the carrier
 - (iii) FM and PM are essentially the same modulation technique
 - (iv) FM and PM are two different names for amplitude modulation
- (e) The process of converting an analog signal into a digital signal in PCM involves:
 - (i) Sampling, modulation and encoding
 - (ii) Demodulation, quantization and encoding
 - (iii) Sampling, quantization and encoding
 - (iv) Demodulation, modulation and encoding
- (f) VSB modulation is a form of:
 - (i) Analog modulation
 - (ii) Digital modulation
 - (iii) Analog to digital conversion
 - (iv) Digital to analog conversion
- (g) What is the criterion for Carson's bandwidth calculation?
- (h) A signal has frequency component from 300 Hz to 1.8 kHz. What is the minimum possible rate at which the signal has to be sampled?
 - (i) Define Apogee and Perigee.
 - (j) what is acceptance angle? Discuss its importance

- Q.2** (a) A modulating signal of $2 \cos 5000t$ is amplitude modulated over a carrier signal of $5 \cos 20000t$. Derive expressions for the modulation index, LSB and USB frequencies, Bandwidth and the ratio of Side Band Power in the Total Power of AM wave. [7]
- (b) Derive the expression for a Amplitude Modulated wave and draw its spectrum. Obtain a relationship between carrier and side band powers in an AM DSBFC wave. [7]
- Q.3** (a) Define the transmission efficiency of AM signal. A transmitter radiates 9 kW without modulation and 10.125 kW after modulation. Determine depth of modulation. [7]
- (b) Explain the principle of Angle Modulation. For an FM modulator with a peak frequency deviation $\Delta f = 20$ kHz, a modulating signal frequency $f_m = 10$ kHz. Find the bandwidth using carson's rule. [7]
- Q.4** What are the main challenges and consideration in ensuring network security in modern communication systems? Discuss the role of encryption, authentication and intrusion detection system in safeguarding data transmission. [7]
- Q.5** (a) What is the basic limitation of SSB modulation scheme? How is it eliminated by VSB modulation? [7]
- (b) Draw the block diagram of super heterodyne AM receiver and explain the function of IF amplifier. [7]
- Q.6** (a) 8.0 micrometer core diameter single mode fiber has a core refractive index of 2, relative refractive index difference of 0.3% and operating wavelength of 1.55 micrometer. Determine critical radius of curvature. Explain bending losses. [7]
- (b) Discuss the Armstrong's method of indirect FM generation in detail. [7]
- Q.7** (a) Explain the sampling process of a signal mathematically. How to generate PPM from PWM signal? [7]
- (b) Explain flat top sampling in detail. [7]
- Q.8** (a) Explain telemetry, tracking and command control system in detail. [7]
- (b) Explain Snell's law. What is total internal reflection? Explain with suitable diagram. [7]
- Q.9** Write short notes on any two of the following: [7x2]
- Kepler's law of Planetary motion
 - Pulse code modulation
 - ASK, FSK, BPSK, QPSK
 - Power calculation of AM signal

