# Code : 110501

**B.Tech 5th Semester Exam., 2020**
**(New Course)**

## ANALOG AND DIGITAL COMMUNICATION SYSTEM

*Time* : 3 hours *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.*

**1.** Answer any *seven* of the following questions : 2×7=14

(a) What is the criterion for Carson's bandwidth calculation?

(b) List the advantages of DSB-FC modulation scheme.

(c) 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?

(d) Define the numerical aperture of step index fiber.

(e) What is the need of cladding?





(f) What are the advantages of geostationary satellite?

(g) Mention the uses of frequency discriminator in FM demodulation.

(h) Write the advantages of hand-off process.

(i) What do you mean by baseband signal?

(j) Compare the spectrum occupancy of PSK and FSK schemes.

**2.** (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

**3.** (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

**4.** (a) What is ISI? Explain how ISI can be removed by employing a raised cosine filter. 7

(b) Derive the output SNR of AM envelop detector. Also calculate its figure of merit. 7

5. (a) Explain the convolution codes, their advantages and disadvantages. 7

(b) A sinusoidal message signal of peak voltage 20 V and peak frequency of 5 kHz is transmitted through 256 levels PCM system. The sampling rate is 25% higher than Nyquist rate. Calculate the sampling frequency, bit rate, bandwidth, step size, maximum quantization error and SNR in dB. 7

6. (a) Explain the sampling process of a signal mathematically. Write how to generate PPM from PWM signal? 7

(b) Derive the power calculation of AM signal. 7

7. (a) What is the probability of error in presence of white noise for BPSK system? We are required to transmit $2{\cdot}08 \times 10^6$ binary digits per second with $P_b \leq 10^{-7}$. The channel noise PSD is $Sn(f) = 10^{-8}$. Determine the transmission bandwidth and signal power required in binary. 7

(b) What are the noise considerations in PCM? Explain the TDM-PAM concept. 7





8. (a) An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ rad/sec is given as follow : 7

$$\phi_{FM}(t) = 10\cos(\omega_c t + 5\sin(3000t) + 10\sin(2000t))$$

(i) Find power of modulated signal.

(ii) Find the maximum frequency deviation.

(iii) Find the maximum phase deviation.

(iv) Estimate the bandwidth of FM signal.

(b) Explain the different types of diversity technique used in wireless communication system. 7

9. (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