

B.E./E.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007

Fifth Semester

Electronics and Communication Engineering

EC 332 --- COMMUNICATION THEORY AND SYSTEMS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A --- (10 × 2 = 20 marks)

1. If a 10 kW amplitude modulated transmitter is modulated sinusoidally by 50%, what is the total RF power delivered?
2. A carrier of 20 MHz is amplitude modulated with a signal frequency of 3 kHz and amplitude 5 V. If the $m_a = 0.5$, sketch the spectra of the waveform.
3. Determine the Bandwidth of a wideband FM, given that carrier signal of 100 MHz frequency modulates a signal of 5 kHz with the 50 kHz as frequency deviation.
4. What is capture effect in FM?
5. Find the thermal noise voltage developed across a resistor of 700 Ω . The bandwidth of the measuring instruments is 7 MHz and the ambient temperature is 27°C.
6. What is shot noise?
7. What is the $\frac{S_o/N_o}{S_i/N_i}$ for AM (with envelope detection) with small noise case?
8. Draw the phasor representation of FM noise.
9. Is transinformation of a continuous system non-negative? If so, why?
10. Write the expression for code efficiency in terms of Entropy.

11. (i) In AM system, the transmitter gives a output power of 5 kW when modulated to a depth of 95%. If after modulation by a data signal which produces an average modulation depth of 20%, the carrier and one side band are suppressed, determine the average power in the remaining output. (6)

(ii) Explain the generation of SSB using Balanced modulator. (11)

12. (a) (i) Draw the circuit of reactance modulator and explain its principle of operation. Derive an expression for the equivalent capacitance in terms of the g_m of the device and circuit components. (10)

(ii) A modulating signal $5 \cos 2\pi 15 \times 10^3 t$ angle modulates a carrier $A \cos \omega_c t$. Find the modulation index and bandwidth for FM system and determine the change in bandwidth and the modulation index for FM if f_m is reduced by 5 kHz. (6)

Or

(b) (i) Explain any two techniques of demodulation of FM. (10)

(ii) Explain how varactor diode can be used for frequency modulation. (6)

13. (a) (i) A town has a population of 10,000 people. Of these 6000 are males and 4000 are females. Also 300 male and 400 females of this population are unemployed. An unemployed person is chosen at random. Find the probability that he is a male. (7)

(ii) Determine the noise figure of a common base transistor amplifier. (9)

Or

(b) Explain the following terms :

(i) Shot noise (ii) Random process

(iii) Noise temperature (iv) Noise figure. (16)

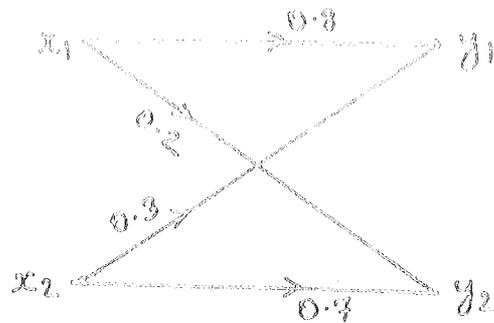
14. (a) (i) Describe the characteristics of superheterodyne receiver. (10)

(ii) Explain about pre-emphasis and de-emphasis circuit. (6)

Or

(b) Compare the performance of noise in AM and FM system. (16)

- (b) (a) Find the mutual information and channel capacity of the channel shown. (Given $p(x_1) = 0.6$, $p(x_2) = 0.4$). (16)



Or

- (b) (i) Apply the Shannon-Fano coding procedure for the following message ensemble.

$$[X] = [x_1 \ x_2 \ x_3 \ x_4 \ x_5 \ x_6 \ x_7]$$

$$[P] = [0.4 \ 0.2 \ 0.12 \ 0.08 \ 0.08 \ 0.08 \ 0.04] \quad (3)$$

- (ii) Derive the capacity of Gaussian channel. (8)