Register Number: ……………………..

**BE., DEGREE EXAMINATIONS APRIL/MAY 2014**

(Regulation 2009)

Fifth Semester

**ELECTRONICS AND COMMUNICATION ENGINEERING**

ECE110 : Communication Theory

**Time: Three Hours**                              **Maximum Marks: 100**

**Answer all the Questions**

**PART A (10 x 1 = 10 Marks)**

1. The process of converting modulated carrier back to the original information is called

   a) Modulation                    b) Demodulation

   c) Deviation                     d) Translation

2. For an AM wave represented by $10[1+0.6 \cos(2\pi \times 1000t)]\cos(2\pi \times 10^6 t)$ the side band frequencies are

   a) 998kHz and 1002kHz            b) 990kHz and 1020kHz

   c) 999kHz and 1001kHz            d) 999kHz and 1002kHz

3. The modulation index of wideband FM system is

   a) $> 1$                         b) $< 1$

   c) $= 1$                         d) $= 0.5$

4. It is used to measure the ability of the receiver to accept a given band of frequencies and reject all others

   a) sensitivity                   b) Selectivity

   c) fidelity                      d) Dynamic range

5. De emphasis circuit is basically

   a) A low pass filter             b) A high pass filter

   c) A band pass filter            d) A band reject filter

6. In the FM receivers, the demodulators are primarily used for

   a) Converting phase changes into amplitude changes    b) Converting frequency changes into amplitude changes

   c) Suppressing the amplitude variations               d) Suppressing the frequency variations

7. In the AM receiver model the noise w(t) is modeled as white Gaussian noise with mean _____ and power spectral density _____.

   a) Zero, $N_o$                   b) One, $N_o/2$

   c) Zero, $N_o/2$                 d) One, $N_o$

8. Figure of merit for coherent detection with SSB modulation is

   a) 0                             b) 1

   c) $\mu/1+\mu$                   d) $\mu/1+\mu^2$

9. Source Coding theorem states that a discrete memory less source of entropy H and average code length L for any source encoding is bounded as

   a) $L \geq -H$                   b) $L \leq -H$

   c) $L \geq H$                    d) $L \leq H$

10. Conditional entropy and Joint entropy is related by H(X,Y) =

    a) H(Y/X)+H(X)=H(X/Y)+H(Y)      b) H(Y/X)+H(Y)=H(X/Y)+H(X)

    c) H(Y)+H(X)=H(X/Y)+H(Y)        d) H(Y)+H(X)=H(Y/X)+H(X)

**PART B (10 x 2 = 20 Marks)**

11. What is Amplitude modulation? Mention the advantages of AM.

12. In an AM transmitter, a 10kW carrier is modulated by 50%, find the total radiated power?

13. How many side bands are present in the FM wave and justify?

14. Mention the difference between FM and PM.

15. What are the disadvantages of TRF receiver?

16. Discuss the merits of phase locked loop FM demodulator over tuned frequency FM demodulator.

17. What is meant by thermal noise?

18. An amplifier has a noise figure of 3dB, Calculate the equivalent noise temperature at $T^o=40^oC$?

19. A source is emitting symbols $X_1$, $X_2$ and $X_3$ with probabilities 0.6, 0.3 and 0.1. What is the entropy of the source?

20. State Information capacity theorem.

**PART C (5 x 14 = 70 Marks)**

21. a)     Explain the operation of balanced ring modulator and obtain the expression for its output voltage.

    **(OR)**

    b) (i)   Analyze and discuss about the generation of SSB using modified phase shift method.                                                          (7)

    (ii)  Draw and explain the operation of emitter modulator.                (7)

22. a) (i) Describe the Armstrong method of FM signal generation and transmission. (8)

    (ii) FM wave is represented by $V_{FM} = 10.\text{Sin} [5X10^8t+4.\text{Sin} 1250t]$. Find a) Carrier (6)
    frequency, b) Modulating frequency, c) Modulation index, d) Maximum
    deviation, e) Power dissipated in a $5\Omega$ resistor.

    **(OR)**

    b) (i) Explain the operation of reactance modulator with neat diagram. (8)

    (ii) What is the need for pre emphasis and de emphasis circuits? Explain both. (6)


23. a) With neat block diagram explain the operation of super heterodyne receiver and
    mention the advantages.

    **(OR)**

    b) (i) For an FM demodulator circuit with transfer function $K_d=0.2V/kHz$ and an FM (4)
    input signal with 20kHz of peak frequency deviation, determine the output
    voltage.

    (ii) Explain the operation of Foster Seely discriminator with neat diagram. (10)


24. a) (i) Obtain the power spectral density of ideal low pass filtered white noise. (4)

    (ii) What is meant by narrow band noise? Describe how it is represented in terms of (10)
    in phase and quadrature components.

    **(OR)**

    b) Explain the (DSB – SC) AM receiver model and obtain the figure of merit of
    ( DSB-SC ) AM receiver using coherent detection.


25. a) Encode the following source code using Shannon-Fano and Huffman coding
    procedure, calculate the efficiency and compare.

| X | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_5$ |
|---|---|---|---|---|---|
| P(X) | 0.3 | 0.1 | 0.4 | 0.08 | 0.12 |

    **(OR)**

    b) (i) Derive the channel capacity of a binary symmetric channel. (8)

    (ii) Mention the properties of Mutual information. (6)


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