



**B.E DEGREE EXAMINATIONS: MAY 2015**

(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. A 60 KHz carrier is amplitude modulated by speech band of 300 to 3000Hz . The range of the upper side band is
  - a) 60.3 to 63 KHz
  - b) 60 to 59.7 KHz
  - c) 57 KHz to 59.7 KHz
  - d) 56.7 to 56.3KHz
2. In a DSB-SC system with 100 % modulation, the power saving is
  - a) 100%
  - b) 75%
  - c) 50%
  - d) 66%
3. A FM signal is being broadcast in the 88.108MHz band having a carrier swing of 12.5KHz. The modulation index is
  - a) 100 %
  - b) 83%
  - c) 67%
  - d) 50%
4. The modulating frequency in frequency modulation is increased from 10KHz to 20KHz. The bandwidth is
  - a) Doubled
  - b) Halved
  - c) Increased tremendously
  - d) Increased by 20KHz
5. A diode detector has a load of 1 Kilo ohms shunted by a load of 10000pF capacitor. The diode has a forward resistance of 1 ohm. The maximum permissible depth of modulation, so as to avoid diagonal clipping with modulating signal frequency of 10KHz will be
  - a) 0.847
  - b) 0.628
  - c) 0.734
  - d) 0.948

6. In a super heterodyne receiver, IF is 455 KHz. If it is tuned to 1200KHz, then image frequency will be
  - a) 1655 KHz
  - b) 2110KHz
  - c) 745 KHz
  - d) 910 KHz
7. Limiter is not essential in the following detector:
  - a) Foster Seeley
  - b) Balanced slope
  - c) Ratio
  - d) PLL
8. In a communication system, the signal power is 13dBm and noise power is -1dBm. The Signal to noise ratio is
  - a) 14dB
  - b) -13dB
  - c) 12dBm
  - d) 12 dB
9. Information content in a certain event is
  - a) Infinite
  - b) 1
  - c) Zero
  - d) -1
10. The efficiency of a Huffman code is linearly proportional to
  - a) Average code length
  - b) Maximum length of code
  - c) Bit rate
  - d) Average entropy

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

11. Draw the phasor diagram of AM signal.
12. Distinguish between low level and high level modulator.
13. Computes the bandwidth required for an FM wave in which the modulating frequency signal is 2 KHz and the maximum frequency deviation is 12 KHz?
14. State Carson's rule for finding the bandwidth of an FM signal.
15. What is meant by diagonal clipping and negative peak clipping?
16. Determine and draw the instantaneous frequency of a wave having a total phase angle given by  $\phi(t) = 2000t + \sin 10t$ .
17. Calculate the overall noise figure of a three stage cascaded amplifier each stage having a power gain of 10dB and a noise figure of 6 dB.
18. Define the term noise temperature.
19. What is channel capacity of binary symmetric channel with error probability of 0.2?
20. Give the desired properties of a source code.

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

21. a) (i) With circuit diagram, explain the operation of class A and class C Amplitude Modulator. (10)
- (ii) When a signal  $m(t) = 3 \cos (2\pi \times 103t)$  modulates a carrier  $c(t) = 5 \cos (\pi \times 10^6 t)$ , find the modulation index and transmission bandwidth if the modulation is AM. (4)
- (OR)**
- b) (i) Explain the generation of SSB using balanced modulator. (10)
- (ii) Find the transmitted power of a message signal of frequency 400Hz which is amplitude modulated by a carrier of frequency 15KHz of power 0.5KW. (4)
22. a) (i) Derive the expression for the frequency modulated signal. Explain what is meant by narrowband FM and wideband FM using the expression. (7)
- (ii) Discuss the effects of nonlinearities in FM. (7)
- (OR)**
- b) (i) Explain the working of the reactance modulator. (7)
- (ii) Derive an expression to show how the variation of the amplitude of the input signal changes the frequency of the output signal of the reactance modulator. (7)
23. a) (i) Discuss the operation of AM super heterodyne receiver. (7)
- (ii) Discuss the coherent detection of DSB-SC modulated wave with a block diagram of detector and Explain. (7)
- (OR)**
- b) (i) Explain the different receiver characteristics and their measurement. (4)
- (ii) Draw the circuit diagram of Foster-Seelay discriminator and explain its working. (10)
24. a) (i) Derive the effective noise temperature of a cascade amplifier. Explain how the various noise are generated in the method of representing them. (7)
- (ii) Illustrate how threshold effect in FM system can be overcome. (7)
- (OR)**
- b) (i) Derive the expression for output signal to noise ratio for a DSB-SC receiver using coherent detection. (7)
- (ii) What is meant by noise equivalent bandwidth? Illustrate it with a diagram. (7)

25. a) (i) State and prove the additivity property of entropy. (7)  
(ii) Use Huffman coding procedure to encode a set of messages with the (7)  
probabilities of occurrence as given below:  
0.22, 0.16, 0.10, 0.12, 0.1, 0.06, 0.06, 0.08, 0.06, 0.04

(OR)

- b) (i) Derive channel capacity formula for binary symmetric channel. (7)  
(ii) Five symbols of the alphabet of discrete memory less source and their (7)  
probabilities are given below:  
 $S=[S_0, S_1, S_2, S_3, S_4]$   
 $P[S]=[0.4, 0.2, 0.2, 0.1, 0.1]$   
Encode the symbols using Huffman coding.

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