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**Question Paper Code : 50438**

**B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017**

**Fourth Semester**

**Electronics and Communication Engineering**

**EC 6402 – COMMUNICATION THEORY**

**(Regulations 2013)**

**Time : Three Hours**

**Maximum : 100 Marks**

**Answer ALL questions**

**PART – A**

**(10×2=20 Marks)**

1. Determine the Hilbert Transform of  $\cos \omega t$ .
2. What is VSB ? Where is it used ?
3. A frequency modulated signal is given as  $s(t) = 20\cos[2\pi f_c t + 4\sin(200\pi t)]$ . Determine the required transmission bandwidth.
4. How is narrowband signal distinguished from wideband signal ?
5. State central limit theorem.
6. What is meant by ergodic process ?
7. Define the term noise equivalent temperature.
8. List the external sources of noise.
9. Using Shannon law determine the maximum capacity of 5MHz channel with S/N ratio of 10dB.
10. Define entropy.

**PART – B**

**(5×13=65 Marks)**

11. a) i) Explain the operation of envelope detector. (7)
  - ii) Discuss the generation of single sideband modulated signal. (6)
- (OR)
- b) Explain the operation of super heterodyne receiver with neat block diagram. Draw signal at the output of each block. (13)



12. a) i) Explain the generation of FM signal using the direct method. (8)  
 ii) List the advantages of frequency modulation over amplitude modulation. (5)
- (OR)
- b) Explain the FM demodulation process using frequency discrimination process.
13. a) i) Discuss the properties of Gaussian noise process. (6)  
 ii) Derive the input and output relationship of a random process applied through a LTI filter. (7)
- (OR)
- b) i) Consider a random process defined as  $X(t) = A \cos \omega t$ , where  $\omega$  is a constant and  $A$  is random uniformly distributed over  $[0, 1]$ . Find the autocorrelation and auto covariance of  $X(t)$ . (7)  
 ii) Distinguish between random variable and random process. Give examples to each. (6)
14. a) Obtain the expression for the figure of merit of the AM receiver. (13)
- (OR)
- b) i) Explain the operation of pre emphasis and de emphasis in the FM communication system. (9)  
 ii) An amplifier has three stages with gain 5 dB, 20 dB and 12 dB. The noise figures of the stages are 7 dB, 13 dB and 12 dB respectively. Determine the overall noise figure and the noise equivalent temperature. (4)
15. a) A source emits one of the four symbols A, B, C and D with probabilities  $1/3$ ,  $1/6$ ,  $1/4$  and  $1/4$  respectively. The emissions of symbols by the source are statistically independent. Determine the average code length and coding efficiency if the Shannon Fano coding is used. (13)
- (OR)
- b) i) Discuss about discrete memoryless channels. (6)  
 ii) Explain the properties of entropy. (7)

## PART – C

(1×15=15 Marks)

16. a) Which modulation will be suitable for transmitting your audio file ? Assume your audio frequency and obtain its spectrum response ? Is there any transformation needed for transmission. Summarize the modulation analysis and explain. Why and how this modulation suits.
- (OR)
- b) Compile your favourite song modulate it and favourite it. During the transmission what are the noises may occur and how can you reduce noise at the receiver end. Obtain the PSD of your signal.