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Question Paper Code : X 60445

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fourth Semester
Electronics and Communication Engineering
EC 2252/EC 42/EC 1252/080290020 – COMMUNICATION THEORY
(Regulations 2008)
(Common to PTEC 2252 Communication Theory for B.E. (Part-Time)
Third Semester – ECE – Regulations 2009)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. For the baseband signal $m(t) = \cos(w_m t)$, find the DSB-SC signal and sketch its spectrum.
2. Define VSB and state any one of its application.
3. Define the modulation index of FM.
4. What is the need for pre emphasis ?
5. Define noise figure.
6. Define SNR.
7. What are the methods to improve FM threshold reduction ?
8. What is capture effect ?
9. State source coding theorem.
10. Define Shannon's channel coding theorem.

PART – B **(5×16=80 Marks)**

11. a) i) Discuss in detail about frequency translation and frequency division multiflexing technique with suitable diagrams. **(8)**

ii) How an amplitude modulated signal can be generated using a non-linear modulator circuit ? Explain. **(8)**

(OR)

b) i) Discuss the methods of demodulation of DSBSC signal using costas loop. **(8)**

ii) Compare the characteristics of DSBFC, DSBSC, SSBFC, SSBSC schemes. **(8)**

12. a) i) The message signal $m(t) = a\cos(2\pi f_m t)$ is used to either frequency modulate or phase modulate the carrier $A_c\cos(2\pi f_c t)$. Find the modulated signal in each case. **(4)**

ii) Bring out the relationship between PM and FM. **(4)**

iii) Describe a method each for generation and demodulation of FM signal. **(8)**

(OR)

b) i) An angle modulated signal has the form $u(t) = 100\cos[2\pi f_c t + 4\sin 2000\pi t]$ where $f_c = 10$ MHz. Determine the average transmitted power, peak phase deviation and peak frequency deviation. Is this an FM or a PM signal ? Explain. **(6)**

ii) With the relevant expressions and figures (if any), compare and contrast narrowband and wideband FM. **(10)**

13. a) i) Derive the expression for shot noise voltage. **(10)**

ii) Give the properties of auto correlation function. **(6)**

(OR)

b) i) A mixer stage has a noise figure of 20 dB and this is preceded by an amplifier that has a noise figure of 9 dB and an available power gain of 15 dB. Calculate the overall noise figure referred to the input. **(8)**

ii) A receiver has a noise figure of 12 dB and it is fed by a low noise amplifier that has a gain of 50 dB and a noise temperature of 90 K. Calculate the noise temperature of the receiver and the overall noise temperature of the receiving system. Take room temperature as 290 K. **(8)**

14. a) i) Draw the super heterodyne receiver and explain the operation of each block. **(10)**

ii) Derive the figure of merit for AM system for non-coherent system, with suitable assumptions. **(6)**

(OR)

b) i) Derive the figure of merit of a FM system. **(10)**

ii) Explain FM threshold effect. **(6)**

15. a) i) Find the Huffman coding for the probabilities P = {0.0625, 0.25, 0.125, 0.125, 0.25, 0.125, 0.0625} and the efficiency of the code. **(10)**

ii) State Shannon's theorems and explain. **(6)**

(OR)

b) i) Consider the following binary sequence 11101001100010110100... use the Lempel-Ziv algorithm to encode this sequence. Assume that the binary symbols 0 and 1 are already in the codebook. **(10)**

ii) A telephone network has a bandwidth of 3.4 kHz. Calculate the information capacity of the telephone channel for a signal-to-noise ratio of 30 dB. **(3)**

iii) Calculate the minimum signal-to-noise ratio required to support information transmission through the telephone channel at the rate of 9600 bits/sec with bandwidth of 9.6 kHz. **(3)**

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