

Exam.Code:0928  
Sub. Code: 6904

1048  
B.E. (Electronics and Communication Engineering)  
Fourth Semester  
EC-401/416: Communication Engineering

Time allowed: 3 Hours

Max. Marks: 50

*NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Use of scientific calculator is allowed.*

x-x-x

- I.
- (a) What is Quadrature carrier modulation? (1)
  - (b) Define image frequency. (1)
  - (c) What is meant by threshold effect in AM receivers? (1)
  - (d) What is vestigial side band modulation? (1)
  - (e) State sampling theorem for bandpass signals. (1)
  - (f) What is capture effect in FM receivers? (1)
  - (g) What is difference between demodulation and detection? (1)
  - (h) What quantization error? (1)
  - (i) Differentiate between narrow band and wide band FM. (1)
  - (j) What is meant by Additive White Gaussian Noise? (1)

Part- A

- II.
- (a) Define modulation. Why is it required? (3)
  - (b) Define modulation indices of AM, FM and PM signals. Also draw these signals for a sinusoidal modulating signal. (3)
  - (c) Compare the merits and demerits of AM and FM communication systems. Based on this comparison, which system will you prefer and why? (4)
- III.
- (a) What is DSB-SC signal? What are its advantages over standard AM signal? Explain its generation. (4)
  - (b) Draw the block diagram of indirect method of FM generation to generate an FM signal at carrier frequency of 95.3 MHz and frequency deviation of 75 kHz. A narrow band FM signal is available at a carrier frequency of 200 kHz and a frequency deviation of 12.2 Hz. You can use frequency doublers and triplers. (4)

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(c) Define Nyquist rate and Nyquist interval and hence determine these values for the following continuous time signal:

$$f(t) = 6\cos 50\pi t + 20\sin 300\pi t - 10\cos 100\pi t. \quad (2)$$

- IV. (a) Describe relation between frequency modulation and phase modulation. (2)  
(b) Derive expression for FM signal. (2)  
(c) Prove that amplitude modulation is a linear process and angle modulation is a non-linear process. (3)  
(d) Describe pulse modulation and its types. (3)

Part-B

- V. (a) What are advantages of using digital techniques for transmission of analog information? Describe briefly the steps involved in converting an analog continuous time signal into a digital signal. (5)  
(b) Describe adaptive delta modulation. (3)  
(c) Define companding. What is its need? (2)
- VI. (a) Define figure of merit of a radio receiver. What is its significance? Compare the performance of AM and FM receivers on the basis of figure of merit. (5)  
(b) What are line codes? Represent the bit stream 101101001 using the following line codes:  
(1) Unipolar NRZ  
(2) Polar NRZ  
(3) Unipolar RZ  
(4) Polar RZ  
(5) Manchester code. (3)  
(c) Explain Nyquist criterion for zero ISI. (2)
- VII. (a) Derive expression for impulse response of a matched filter. What are its important properties? (5)  
(b) Describe baseband M-ary transmission. (2)  
(c) A PCM system that uses a uniform quantizer is followed by a 7-bit binary encoder. The bit rate of the system is equal to 50 Mb/s.  
(i) What is the maximum message bandwidth for which the system operates satisfactorily?  
(ii) Find the output signal to quantization noise ratio when a full-load sinusoidal modulating wave of frequency 1 MHz is applied to the input. (3)