

**R13**

Code No: 115AK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, November/December - 2016

ANALOG COMMUNICATIONS

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A****(25 Marks)**

- 1.a) Define noise. [2]
- b) What are the similarities and differences between narrowband FM and AM systems? [3]
- c) What is threshold effect in envelope detector? [2]
- d) Distinguish between simple AGC and delayed AGC. [3]
- e) Define the terms frequency deviation and modulation index for FM wave. [2]
- f) Explain the need for modulation. [3]
- g) Give the classification of radio transmitters. [2]
- h) Explain the need of amplitude limiter in FM receiver. [3]
- i) Calculate the percentage saving in power if only one side band transmission is used over the DSB-SC system at (i) 100% modulation (ii) 50% modulation. [2]
- j) State the sampling theorem. [3]

**PART - B****(50 Marks)**

- 2.a) Define modulation and explain the need of modulation.
  - b) A carrier with amplitude modulated to a depth of 50% by a sinusoidal, produces side band frequencies of 5.005 MHz and 4.995MHz. The amplitude of each side frequency is 40V. Find the frequency and amplitude of the carrier signal. [5+5]
- OR**
- 3.a) Draw the block diagram and explain generation of DSB-SC signal using balanced modulator.
  - b) A modulating signal is a multi-tone signal given by  
$$m(t) = A_1 \cos \omega_1 t + A_2 \cos \omega_2 t + A_3 \cos \omega_3 t$$

The signal  $m(t)$  modulates a carrier  $A_c \cos \omega_c t$ . Plot the signal sided spectrum and find the bandwidth of the modulating signal. Assume that  $\omega_3 > \omega_2 > \omega_1$  and  $A_3 > A_2 > A_1$ . [5+5]
- 4.a) What is SSB Modulation and what are its advantages? Draw the block diagram for SSB generation using Phase discrimination method and explain its operation.
  - b) Explain how the base band signal can be recovered from the VSB Signal plus carrier using envelope detector. [5+5]

**OR**

- 5.a) Mention applications of different AM Systems.  
b) A vestigial filter has a transfer function  $H(f)$  with  $f_c = 10^5 \text{ Hz}$ . Find the VSB modulated signal when  $e_m(t) = \cos(2\pi f_m t)$  and  $e_c(t) = 2\cos(2\pi f_c t)$ . Assume  $f_m = 10^3 \text{ Hz}$ . [5+5]

- 6.a) Discuss the effect of modulation index on the band width of FM. Explain the generation of WBFM from NBFM with neat sketch.  
b) A carrier is frequency modulated by a sinusoidal modulating of frequency 2 kHz, resulting in a frequency deviation of 5 kHz. What is the bandwidth occupied by the modulated waveform? The amplitude of the modulating sinusoid is increased by a factor 2 and its frequency lowered by 500 Hz. What is the new bandwidth? [5+5]

OR

- 7.a) Compare the direct and indirect methods of generating FM signals. Explain Armstrong method of generating FM signals with a neat block schematic diagram.  
b) Draw the spectral representation of FM wave and derive the expression the Transmission bandwidth. [5+5]

- 8.a) Draw the AM receiver model and determine the signal to noise ratio of AM system.  
b) What is the noise equivalent band width? Discuss the trade of between bandwidth and S/N ratio. [5+5]

OR

9. Explain the following:  
a) Resistive noise source.  
b) Shot noise.  
c) In phase and quadrature phase components and its properties.  
d) Noise Figure. [10]

- 10.a) Explain the operation of Superhetrodyne receiver with a neat schematic diagram.  
b) Explain the terms:  
i) Automatic Gain Control (AGC).  
ii) Amplitude limiting  
iii) Squelch circuit. [5+5]

OR

- 11.a) Compare the pulse modulation systems and continuous modulation systems.  
b) What is Multiplexing? What are the advantages of Multiplexing? Explain how do you generate Time Division Multiplexing (TDM) signals. [5+5]

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