

SE203 - Analog and Digital Communication

P. Pages : 2

GUG/W/24/13913

Time : Three Hours



Max. Marks : 80

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- Notes :
1. All questions carry marks as indicated.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Derive an expression for the power content and transmission efficiency of a single tone amplitude modulated signal. **8**
b) Draw and explain the block diagram of generation SSB signal using phase shift method also write the mathematical expression of SSS signal. **8**

OR

2. a) A carrier wave $V_c = 4 \cos(2\pi \times 500 \times 10^3 t)$ is amplitude modulated by an audio wave $V_m = 0.2 \cos 3[(2\pi \times 500 t) + 0.1 \sin 5(2\pi \times 500 t)]$. Calculate the upper and lower sideband frequencies also estimate total power in sidebands. Assume antenna resistance is 10Ω . **8**
b) Draw and explain the block diagram of an analog communication system. Also explain the need of modulation. **8**
3. a) Draw and explain the operation of transistor reactance FM modulator. **8**
b) Draw and explain the block diagram of Armstrong frequency modulation system. **8**

OR

4. a) A 2.5 kHz audio signal modulates a 60 MHz carrier causing a frequency deviation of 2.5 kHz. Calculate the modulation index and the bandwidth of FM signal. **4**
b) Determine the relative power of the carrier and side frequencies when modulation index $M = 0.25$ for 10 kW FM transmitter. **4**
c) Draw and explain the operation phase discriminator circuit. **8**
5. a) Explain the following performance parameters for the receiver. **8**
i) Sensitivity. ii) Selectivity
iii) Fidelity iv) Signal to noise ratio.
b) What is superheterodyne receiver. Draw and explain the block diagram of superheterodyne AM receiver. **8**

OR

6. a) Explain pre-emphasis and De-emphasis circuit with their characteristics curve. 8
- b) In a superhet AM receiver using RF stage has loaded 'Q' at the input of mixer to be 100. If intermediate frequency is 455 kHz. 8
- i) Calculate image frequency and its rejection at 1000 kHz without RF stage.
- ii) Calculate the loaded Q of RF amp^r to make image frequency as good at 25 MHz as it was at 1000 kHz.

7. a) What is aliasing effect. State and prove sampling theorem. 8
- b) What is pulse modulation. Explain modulation and demodulation of PWM. 8

OR

8. a) What is PCM. Explain with block diagram the generation and reconstruction of PCM signal. 8
- b) An audio signal has spectral components present in the range of 300 Hz to 3300 Hz. A PCM signal is generated by sampling this audio signal at $F_s = 8$ kHz. The minimum value of signal to Quantization noise ratio is 30dB. Calculate 8
- i) The minimum number of quantization levels Q and number of binary digits per word N.
- ii) Signaling rate 'r'.
- iii) Minimum transmission Bandwidth.

9. a) Explain with block diagram and space diagram the QAM transmitter and receiver. 8
- b) Explain M-array PSK system. What is the condition that makes M-array PSK and QPSK. 8

OR

10. a) In a digital CW communication system, the bit rate of NRZ data stream is 1mbps and carrier frequency of transmission is 100 MHz. Find the symbol rate of transmission and bandwidth requirement of the channel in following cases of different techniques used 8
- i) BPSK system
- ii) QPSK system
- iii) 16-array PSK system.
- b) Explain the working of M-ary FSK transmitter and receiver. 8
