

Total No. of printed pages = 4

EE 131606 OR

Roll No. of candidate

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2022

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Azara, Hatkhowapara,  
Guwahati - 781017

B.Tech. 6<sup>th</sup> Semester End-Term Examination

COMMUNICATION ENGINEERING

(Old Regulation)

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks  
for the questions.

Answer question No. 1 and any *six* from the rest.

1. Answer the following (MCQ/ Fill in the blanks) : (10 × 1 = 10)
- (i) Amplitude shift keying is also known as on-off keying
- (a) True
- (b) False
- (ii) \_\_\_\_\_ is fundamental requirement of communication system
- (a) Amplification
- (b) Filtering
- (c) Mixing
- (d) Modulation
- (iii) \_\_\_\_\_ noise is sometimes called white noise
- (a) Thermal
- (b) Atmospheric
- (c) Transit time
- (d) Flicker
- (iv) Thermal noise is independent of
- (a) Boltzmann's constant
- (b) Temperature
- (c) Bandwidth
- (d) Centre frequency

[Turn over

- (v) The modulation index of an FM wave is changed from 0 to 1. The transmitted power is
- (a) Unchanged
  - (b) Halved
  - (c) Increased by 50%
  - (d) Doubled
- (vi) The maximum transmission efficiency of AM signal is
- (a) 100%
  - (b) 66.67%
  - (c) 50%
  - (d) 33.33%
- (vii) The bandwidth of an FM signal requires at least 10 times the bandwidth of the
- (a) Carrier
  - (b) Modulating
  - (c) AM
  - (d) PM
- (viii) For wideband FM, the frequency modulation index is
- (a) Approximately unity
  - (b) Much less than unity
  - (c) Much greater than unity
  - (d) Infinity
- (ix) A PLL can be used to demodulate
- (a) An AM signal
  - (b) A DSB SC signal
  - (c) A SSB signal
  - (d) An FM signal
- (x) A continuous time signal is given by  $s(t) = 8\cos(200\pi t)$ . The minimum sampling rate to avoid aliasing is
- (a) 100 Hz
  - (b) 200 Hz
  - (c) 400 Hz
  - (d) 800 Hz

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2. (a) Define Noise. Give a brief classification of the different types of noises. (2+4=6)
- (b) Calculate the noise voltage at the input of a television RF amplifier using a device, that has a  $200 \Omega$  equivalent noise resistance and a  $300 \Omega$  input resistance. The bandwidth of the amplifier is 6 MHz and the temperature is  $17^\circ\text{C}$ . (4)
- (c) What is Gaussian noise? Explain briefly. (5)
3. (a) Define amplitude modulation. Derive the relationship between the total transmitted power and carrier power in an AM system when several frequencies simultaneously modulate a carrier. (8)
- (b) The output signal from an AM modulator is  $u(t) = 5 \cos 1800 \pi t + 20 \cos 2000 \pi t + 5 \cos 2200 \pi t$
- (i) Determine the modulating signal  $m(t)$  and the carrier signal  $c(t)$
- (ii) Determine the modulation index.
- (iii) Determine the ratio of the power in the sidebands to the power in the carrier. (2+2+3=7)
4. (a) Derive the time-domain expression of a single-tone frequency modulated signal. (5)
- (b) How can frequency modulated wave be generated using phase modulator. (5)
- (c) A 10 MHz carrier signal is frequency modulated using a modulating signal  $v_m(t) = V_m \sin(10000 \pi t)$ . The resultant FM signal has frequency deviation of 5 kHz. Calculate the modulation index of the FM wave. (5)
5. (a) Draw the block diagram of an AM superheterodyne receiver and describe its operation and the primary function of each stage. (10)
- (b) Show that for a 100% modulation, each sideband of an AM signal contains one-sixth of the total transmitted power. (5)
6. (a) Why pre-emphasis and de-emphasis are required in FM broadcasting? Discuss briefly. (5)
- (b) Explain the principle of FM wave generation using direct method. State the merits and demerits of this method. (10)
7. (a) State and prove sampling theorem for baseband signal. (8)
- (b) What is Quantization error? How does it depend on step size. (2+1=3)
- (c) Specify the Nyquist rate and Nyquist interval for the signal  $g(t) = \sin c(200t) + \sin^2(200t)$ . (4)

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8. (a) What is Time division multiplexing (TDM)? Explain a PCM-TDM system using block diagram. (10)
- (b) Explain Quantizing process. What is meant by quantization range. (3+2= 5)
9. (a) Write briefly about Amplitude Shift Keying (ASK), Phase Shift Keying (PSK) and Frequency Shift Keying (FSK). (4×3=12)
- (b) Determine the bandwidth and baud for the FSK signal with a mark frequency of 39 kHz and a space frequency of 41 kHz and a bit rate of 2kbps. (3)

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