

2025

M.Sc. 3rd Semester Examination

ELECTRONICS

Paper : ELC - 301

(Electronic Communication)

Full Marks : 50

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

Group - A

Answer any *four* questions : $2 \times 4 = 8$

1. An analog signal is band limited to 8 kHz and sampled at the Nyquist rate. The samples are quantized into 4 levels. Let the quantized levels be independent and equiprobable. If 2 quantized samples are transmitted per second then find the information rate.
2. A communication system has a noise temperature of 400 K. Find its noise figure.
3. What is a linear channel code and a systematic channel code?

P.T.O.

(2)

4. What do you mean by VSB-AM signal? Mention some of its uses. 1+1
5. Discuss the phase-shift method for SSB generation.
6. What is pre-emphasis and de-emphasis in an FM system?

Group - B

Answer any *four* questions : 4×4=16

7. In a GSM system, base station provides "timing advance" to mobile terminal for performing timing synchronization. The bit transmission rate is 271 kbps, and the maximum cell radius is 35 km. Find the minimum no. of bits needed to be reserved for "timing advance" field in a GSM system. ["timing advance" corresponds to the two-way delay].
8. Explain the method of coherent detection for AM demodulation. What is frequency conversion? 2+2
9. An angle-modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is described by the equation
- $$\phi_{EM}(t) = 10 \cos \{ \omega_c t + 5 \sin 3000t + 10 \sin 2000\pi t \}.$$
- Find the power of the modulated signal, frequency deviation, phase deviation and bandwidth of $\phi_{EM}(t)$. 1+1+1+1
10. Define ASK, PSK, FSK and QAM. 1+1+1+1

(3)

11. A computer executes four instructions that are designated by the code words 00, 01, 10 and 11 respectively. Assuming the instructions are used independently with probabilities $1/2$, $1/8$, $1/8$ and $1/4$ respectively, calculate the percentage by which the number of bits used for the instructions may be reduced using Huffman code.
12. Calculate the percentage power saving when the carrier and one of the sidebands are suppressed in an AM signal modulated to a depth of (a) 50%, (b) 100%.

Group - C

Answer any *two* questions : $8 \times 2 = 16$

13. With a neat sketch discuss Armstrong method of wide-band FM generation. How can you demodulate FM signal using PLL? $5+3$
14. With a neat sketch explain how a PCM system works. What do you mean by TDM and TDMA? Define the terms SNR and BER. $4+2+2$
15. A 1 GB hard disk is used to store uncompounded PCM data. A telecommunication grade voice signal is sampled at 8K samples/sec and the encoded PCM data is to have an SNR of at least 30 dB. How many minutes of voice conversation can be stored in the hard disk? Assume the crest factor of the voice signal to be 1.

P.T.O.

16. A radio announcer describes a television picture orally in 1000 words out of his vocabulary of 10,000 words. Assume that each of the 10,000 words is equally likely to occur in the description of the TV picture. The TV picture consists of 0.1 million pixels. Each of the pixels can assume 16 different brightness values with equal probability. Find the information content of the TV picture with respect to the radio announcer's description of the picture.

[Internal Assessment - 10 marks]
