

2026

ELECTRONICS — HONOURS

Paper : DSCC-5

(Electronic Communication)

Full Marks : 75

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

1. Answer **any ten** questions :

2×10

- (a) What is the need for a sample and hold circuit in pulse communication?
- (b) Define noise figure in communication systems.
- (c) State one disadvantage of FM systems over AM.
- (d) State Sampling theorem.
- (e) What is quadrature null effect?
- (f) State the expression for maximum information capacity of a channel.
- (g) What is the shape of sectors in cellular communication and why?
- (h) What is an IMEI number?
- (i) Why is the modulation index of AM systems restricted to 1?
- (j) State advantages of 4G mobile communication system over the previous generation.
- (k) Draw the PSK waveform for the following signal $x(n) = 10110$.
- (l) What is meant by virtual height in radio-wave propagation?

Group - B

Answer **any three** questions from the following.

- 2. (a) Find the maximum efficiency of an AM system.
- (b) A carrier with power of 1 KW is modulated by two signals with modulation indices of 0.5 and 0.75 respectively. Find the total transmitted power. 3+2
- 3. Explain with relevant diagrams, operation of an AM demodulator circuit. 5
- 4. Explain the terms 'frequency reuse' and 'hand-off' with respect to mobile communication system. 3+2

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5. Define Noise Figure. Find an expression for effective noise figure for a cascaded system. 1+4
6. Draw circuit diagram of a balanced modulator. Hence show how it removes even harmonics in the modulated signal. 1+4

Group - C

Answer *any four* questions.

7. (a) State and prove Sampling theorem.
(b) Find the Nyquist rate for the signal
$$x(t) = \cos(4000 \pi t) \cos(1000 \pi t) / 2\pi.$$

(c) What is Pulse Code Modulation (PCM)? What are the sources of error in a PCM system? 3+2+(2+3)
8. (a) What is meant by Frequency Modulation (FM)? What is frequency deviation? Show how it is related to modulation index.
(b) Explain with the help of a block diagram generation of a narrow band FM. (2+1+2)+5
9. (a) What is the advantage of a superheterodyne receiver over a tuned radio frequency receiver?
(b) What is meant by image frequency in a superheterodyne receiver?
(c) Compare PAM, PWM and PPM. 2+3+5
10. (a) Explain the terms critical frequency, maximum usable frequency (MUF) and what is the relation between them.
(b) What is skip distance?
(c) What is ducting phenomena in radio wave propagation? (2+2+2)+2+2
11. (a) What is the need for modulation? What are the different types of analog modulation?
(b) A modulating signal $10 \sin(2\pi \times 10^3 t)$ is used to amplitude modulate a carrier signal $20 \sin(2\pi \times 10^4 t)$. Determine the modulation index, frequencies of the sideband components and their amplitudes. Sketch the output waveform.
(c) In an FM system, the modulation index is 60 for a modulating signal of voltage of 2.4 V and frequency 400 Hz. Calculate the modulation index if the signal voltage is changed to 3.2 V with a frequency of 250 Hz. (2+1)+(1+1+2)+3
12. (a) What is the advantage of shift-keying techniques in digital modulation?
(b) Explain with suitable example the BPSK technique.
(c) Compare TDM and FDM. 2+5+3