

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURUJADA VIZINAGARAM
II B. TECH II SEMESTER SUPPLIMENTRY EXAMINATIONS NOV -2025
ANALOG AND DIGITAL COMMUNICATIONS
(DEPARTMENT OF ECE)

Time: 3 hours**Max. Marks: 70****The Question paper consists of Part A & Part B.****Part A is compulsory, Answer all questions. Part B Answers any one question from each unit.***********

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| 1 | PART-A | (20Marks) |
| | a) Define SSB-SC modulation. | [2] |
| | b) Which AM technique is more power-efficient: DSB-SC or AM? Why? | [2] |
| | c) Why is angle modulation called non-linear modulation? | [2] |
| | d) Name two methods used to generate FM signals. | [2] |
| | e) What is the purpose of pre-emphasis in FM transmission. | [2] |
| | f) What is image frequency and why is it a problem. | [2] |
| | g) What is the main advantage of Pulse Position Modulation (PPM) over PWM. | [2] |
| | h) Compare PCM and DM in terms of bandwidth and complexity. | [2] |
| | i) What is the advantage of Quadrature Phase Shift Keying (QPSK) over BPSK. | [2] |
| | j) What is inter symbol interference (ISI) and how can it be minimized. | [2] |
| | PART-B | (50Marks) |
| | Question from Unit - I | |
| 2 | a) Derive expression for the AM wave and draw its spectrum. | [5] |
| | b) A carrier signal $c(t)=20\cos 2\pi 106t$ is modulated by a message signal having three frequencies 5kHz, 10 kHz and 20 kHz. The corresponding modulation indices are 0.4, 0.5 and 0.6. Sketch the spectrum and calculate bandwidth, power and modulation efficiency. | [5] |
| | (OR) | |
| 3 | a) Derive the equation for SSB-SC signal for an modulating sinusoidal input $m(t)=A_m \cos(w_mt)$. | [5] |
| | b) Compare AM, D.S.B-SC, S.S.B-SC and V.S.B transmission. | [5] |
| | Question from Unit - II | |
| 4 | a) Explain the detection of FM wave using balanced frequency discrimination. | [5] |
| | b) An angle modulated signal is represented in time domain as $s(t) = 10 \cos(2\pi \cdot 10^6 t + 3 \sin 2\pi \cdot 10^3 t)$. Assuming the given signal as PM,
i) Calculate the frequency deviation, modulation index, B.W and power.
ii) Repeat the above calculations when the message frequency is doubled. | [5] |
| | (OR) | |
| 5 | a) What is FM threshold effect? How threshold reduction is achieved in FM receiver. | [5] |
| | b) Derive expression for the figure of merit of an FM system. | [5] |
| | Question from Unit - III | |
| 6 | a) Explain about noise effect in AM and obtain expression for figure of merit. | [5] |
| | b) Prove that the figure of merit of an AM system for single tone modulation with 100% modulation is 1/3. | [5] |
| | (OR) | |
| 7 | a) With neat block diagram, explain the operation of super heterodyne receiver. | [5] |

- b) In a broad cast Super Heterodyne Receiver having no RF amplifier is tuned to 555kHz. The local oscillator frequency is adjusted to 1010kHz and the quality factor is 50. Calculate the intermediate frequency, image frequency and image rejection ratio. [5]

Question from **Unit - IV**

- 8 a) With neat block diagram and waveforms, explain the generation of a PWM signal. [5]

- b) Compare PAM, PWM and PPM systems. [5]

(OR)

- 9 a) With neat block diagram, Explain the process of Sampling and Quantization in digital communication. [5]

- b) A voice frequency signal band limited to 3kHz is transmitted with the use of the DM system. The pulse repetition frequency is 30,000 pulses per second, and the step size is 40mV. Determine the permissible speech signal amplitude to avoid slope overload. [5]

Question from **Unit - V**

- 10 a) What is the need of pulse shaping for optimum transmission in baseband transmission? Explain. [5]

- b) The bit stream 1011100011 is to be transmitted using BPSK. Determine the encoded sequence and transmitted phase sequence. [5]

(OR)

- 11 a) Describe the process of detecting QPSK signals. [5]

- b) Obtain the probability of error for Matched filter. [5]
