

**VIT**Vellore Institute of Technology
ADVANCED BY UNIVERSITY GRANTS COMMISSION, U.G.C. NO. 2, F.NO. 1/2003, D.D. 1/1/2003**Final Assessment Test – November/December 2023**

Course: BITE203L - Principles of Communication Systems

Class NBR(s): 2604 / 2606 / 2610

Time: Three Hours

Slot: G1+TG1

Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS TREATED AS EXAM MALPRACTICE**Answer ALL Questions****(10 X 10 = 100 Marks)**

1. A modulating signal $15 \sin(2\pi \times 103t)$ is used to modulate a carrier signal $30 \sin(2\pi \times 104t)$. Determine the modulation index, percentage modulation, frequencies of the side band components and their amplitudes. What is the bandwidth of the modulated signal? Also draw the spectrum of the AM wave.
2. a) Consider a square law detector, using a non-linear device whose transfer characteristics is defined by $V_2(t) = a_1 v_1(t) + a_2 v_1^2(t)$ where a_1 and a_2 are constants, $v_1(t)$ is the input and $V_2(t)$ is the output. The input consists of the AM wave.
$$V_1(t) = A_c[1 + K_a m(t)]\cos(2\pi f_c t)$$
 - i) Evaluate the output $V_2(t)$.
 - ii) Identify the conditions for which the message signal $m(t)$ may be recovered from $V_2(t)$.
- b) With neat block diagram, explain the functioning of Single Side Band Suppressed Carrier Modulator using Phase Discrimination method. [5]
3. a) Consider an angle modulated signal $x(t) = 3 \cos[2\pi \times 10^6 t + 2 \sin(2\pi \times 10^3 t)]$. Compute [5]
 - i) frequency deviation,
 - ii) Bandwidth and
 - iii) Total Power.
- b) Show the mathematical expression for Wideband Frequency Modulation. Also compare and contrast its characteristics with Narrowband Frequency modulation.