VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA
Odd Mid Semester Examination for Academic Session 2025-26

COURSE NAME: B.Tech   SEMESTER: 3rd

BRANCH NAME: ETC

SUBJECT NAME: Basic Communication Engineering

FULL MARKS: 30   TIME: 90 Minutes

Answer All Questions.
The figures in the right hand margin indicate Marks. *Symbols carry usual meaning.*

Q1. Answer all Questions.   **[2 × 3]**

     a) Compute the Fourier Transform of $\delta(t-t0)$.

     b) Explain why to modulate a signal?

     c) Explain the use of hard limiter in FM.

Q2. a Find the time auto correlation function of $g(t) = e^{-at}u(t)$ **[4×2]**

     b With suitable diagram explain the time shifting, time scaling, time inversion and magnitude shifting operation on analog signal.

OR

     a Explain Dirichlet's conditions for Fourier series / transform.

     b State and prove Parseval's Theorem.

Q3. a A Radio transmitter using AM has unmodulated carrier output power of 10kw and can be modulated to a maximum depth of 90% by a sinusoidal modulating voltage without causing overloading. Find the value to which unmodulated carrier power may be increased without resulting in overloading if the maximum permitted modulation index is restricted to 40%?   **[4×2]**

     b With suitable diagram explain working principle of ring modulator.

OR

     a Explain the effect of phase and frequency error on DSB-SC demodulation.

     b A modulating signal given by

$$m(t) = 2\sin(2\pi \times 500t) + 3\sin(2\pi \times 1100t) + 5\sin(2\pi \times 1300t)$$ amplitude

modulates a carrier given by $c(t) = 10\sin(2\pi \times 10^6 t)$, where all amplitudes are in volts. Determine

       i. The total modulation index

       ii. The frequencies present in the modulated signal.

       iii. The total transmitted power.

Q4. a Explain with suitable diagram, how the Narrow band FM signal may be generated.   **[4×2]**

     b A message signal x(t)=100sin(2000)t frequency modulates a carrier signal

$C(t) = 200\cos(2\pi \times 10^8)t$ with a modulation index of 5. Find

       i. Write down the expression for FM signal.

       ii. What is the peak frequency deviation?

       iii. What is the average power of the modulated signal?

       iv. What is bandwidth of the modulated signal?

OR

     a Explain with suitable diagram the working principle of balanced slope detector used to demodulate FM signal.

     b Differentiate between pre-emphasis and de-emphasis.