Sl. No. of Ques. Paper	: 955	**G**	
Unique Paper Code	: 251503		
Name of Paper	: **Analog Communication : ELHT 502**		
Name of Course	: **B.Sc. (Hons.) Electronics**		
Semester	: **V**		
Duration	: **3 hours**		
Maximum Marks	: **75**		

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all. Question No. 1 is compulsory.
Use of Scientific Calculator is allowed.

1. (a) The spectral components of a waveform are as follows: fundamental, 1 V : second harmonic, 0·7 V. Both are sine waves with zero phase angle. Construct one cycle of the resultant waveform. All voltages given are peak values. 3

   (b) What is the flywheel effect of a tuned circuit and how is it used in the generation of an Amplitude Modulated (AM) wave? Explain using waveforms. 3

   (c) What is Vestigial Side Band AM? What is the advantage of using this form of amplitude modulation? 3

   (d) Justify why frequency modulation is called a constant bandwidth modulation. 3

   (e) Define the terms sensitivity, selectivity and fidelity of any receiver. 3

2. (a) What is the UHF range? Give any application that utilizes this range of frequencies. What are the channels that can be used for the propagation of this frequency range? 4

   (b) What is Thermal Noise? How does the thermal noise depend on the bandwidth and ambient temperature? If the value of a resistor creating thermal noise is doubled, what will happen to the noise power generated by this resistor? 4

   (c) The first three links of a tandon connection have a Signal to Noise Ratio (SNR) of 50 dB each. What will be the overall SNR? Another link with SNR of 20 dB is connected in tandem to the three links. Find the overall SNR of the 4 links. Write your conclusions for such a system. 7

3. (a) A carrier $A \cos \omega_c t$ is modulated by a modulating signal:—

   $$E_m(t) = E_1 \cos \omega_1 t + E_2 \cos \omega_2 t + E_3 \cos \omega_3 t.$$

   Derive expressions for (i) total modulated power, (ii) net modulation index for AM signal. 4

(b) The RMS antenna current of a radio transmitter is 10 A when unmodulated, rising to 12 A when the carrier is modulated by a sinusoid. Calculate the modulation index.   4

(c) With the help of a block diagram, describe the generation of USB signal using the Third Method.   7

4. (a) What is pilot carrier transmission? What are its advantages?   4

(b) A product detector can be used to detect an SSB signal. Explain.   4

(c) Show how a standard AM signal can be generated by using transistorized balanced modulator.   7

5. (a) Derive a formula for the instantaneous value of a frequency modulated wave and define modulation index of frequency modulation.   4

(b) If an FM wave is represented by equation:

$$V_{FM}(t) = 50 \sin(2\pi \times 5 \times 10^8 t) + 10 \cos(2\pi \times 10^3 t),$$

calculate:

(i) Modulation index and maximum deviation.

(ii) Power dissipated by the signal, if R = 75 ohms.   4

(c) What is a Reactance Modulator? How can it be used to generate a frequency modulated signal?   7

6. (a) Differentiate between Narrow Band and Wide Band Frequency Modulation.   4

(b) Give equivalence relationship between FM and PM. List one advantage and one disadvantage of FM over AM.   4

(c) With the help of a diagram, explain the working of a balanced slope detector. List any two advantages over a basic slope detector.   7

7. (a) How many 7 MHz wide TV channels can be multiplexed on an 800 MHz coaxial cable?   4

(b) What do you understand by Automatic Frequency Control? How can it be implemented?   4

(c) Explain the working of a Super Heterodyne AM Receiver with the help of a block diagram. Briefly explain the working of each of these blocks.   7