[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 8761 **C** **Roll No.....**

Unique Paper Code : 251503

Name of the Paper : ELHT-502 : Analog Communication

Name of the Course : B.Sc. (H) Electronics, Part III

Semester : V

Duration : 3 hours

Maximum Marks : 75

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

Instructions for Candidates

Attempt five questions in all. Question no. 1 is compulsory.

1. (a) List three applications of UHF band. 3
   (b) Define noise figure. What is the ideal value of noise figure? 3
   (c) Why can't an audio signal be fed directly to the antenna without modulation? 3
   (d) List two advantages and one disadvantage of frequency modulation as compared to amplitude modulation. 3
   (e) What is double spotting? How can it be removed? 3

2. (a) The Fourier series representation of a square wave, applied as the input to a high-pass filter, is
   $$v(t) = \frac{\pi}{4} + (\cos\omega t - \frac{1}{3}\cos 3\omega t + \frac{1}{5}\cos 5\omega t ...)$$
   Plot the input waveform, input frequency spectrum, transfer function amplitude v/s frequency curve, the output frequency spectrum and the output waveform for T>>RC where T is the periodic time of the input wave. 7
   (b) Derive Friiss' formula for the noise factor of a system comprising of three amplifiers in cascade. 4
   (c) A tandem connection has three links, the first two have an SNR of 44 dB each while the third has an SNR of 22dB. Find the overall SNR. 4

3. (a) Show how a standard AM wave can be generated by using a transistorised balanced modulator. 7
   (b) A signal $v_m(t) = 2\cos 1000\pi t + \cos 2000\pi t$ amplitude modulates a carrier $10\cos 10^5\pi t$. Write down the expression of the modulated wave. Plot the frequency spectrum and calculate the overall modulation index. 4
   (c) Determine the condition to avoid diagonal peak clipping in diode detectors. 4

P.T.O.

4. (a) With the help of a block diagram, describe the generation of a USB signal using the phase cancellation method. 7

(b) Why is the third method preferred over phase cancellation method for SSB generation? 4

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

5. (a) Give expressions for the bandwidth of narrowband and wideband FM.
The equation of an FM wave is
$v(t) = 10 \cos (10^8 t + 4\sin 10^4 t)$
Calculate the carrier and modulating frequencies and the BW occupied by this wave. What is the power delivered to a 1kΩ load. 7

(b) Explain how a PM wave can be generated using an FM wave. 4

(c) What are pre-emphasis and de-emphasis circuits? Why are they required in an FM system? 4

6. (a) Explain, with the help of a complete block diagram, the working of an Armstrong FM system.
Is it a direct or indirect method of FM generation? 7

(b) What is the difference between frequency multiplication and mixing? Which one of these will be used for changing the modulation index of an FM wave? 4

(c) Explain the working of a balanced slope detector. 4

7. (a) Draw the block diagram of a superheterodyne receiver and explain its working. Define the terms sensitivity and selectivity of a receiver. 7

(b) Draw the block diagram of a high level AM transmitter. 4

(c) What is image frequency? Find the image frequency of a superheterodyne receiver which is tuned to 557 kHz and its local oscillator provides an output of 1012 kHz. 4