Department of Electrical Engineering

Subject: Radio Electronics (ELECTIVE V)
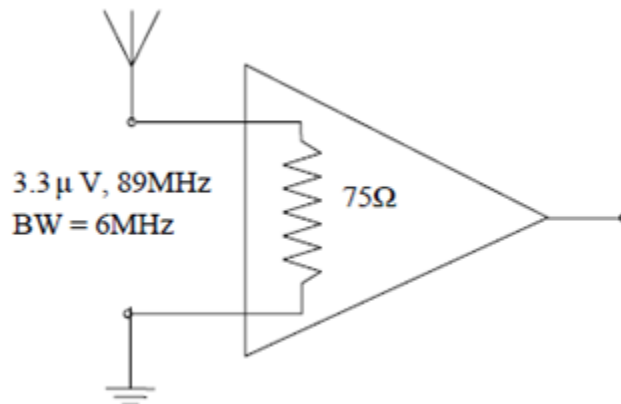
Mid Assignment

Max Marks: 30

Question. 1 (10)

A video receiver with 75 ohms input impedance is matched to the antenna having equivalent temperature of $31^\circ C$. The received signal applied to the amplifier input has frequency of 89MHz, bandwidth of 6MHz and amplitude of 8.3 μ V. the Noise Figure of amplifier is 2.8 dB.

Calculate:
    i.   Input Noise Power
    ii.   Input SNR in dB
    iii.   The noise Factor and SNR at amplifier output
    iv.   Equivalent Noise temperatire of the Amplifier

Question. 2 (10)

    i.   What is the optimal impedance for high power and high voltage transmission over a long distance and how is this number obtained?
    ii.   Determine the height of antenna required to transmit the following two signal over a distance of 10 kilometers. Based on obtained results, discuss the need for modulation
          a. $10\cos 5\times 10^3$
          b. $10\cos 5\times 10^6$
    iii.   Compare the advantages and disadvantages of FM and AM
    iv.   Describe the Heterodyne low level SSB SC AM transmitter with the help of block diagram and which problems does this architecture solve in comparison to high level transmitter design?

Question. 3 (10)

    i.   An AM signal is given by $v(t) = 12\cos 2.5 \times 10^9 t(1 + 0.5\cos 5 \times 10^3 t)\,\mathrm{V}$

          a. Write the equations for message and carrier signals

          b. Find the frequencies of the message and carrier signals and draw them in time domain

          c. Calculate the depth of modulation

          d. Draw the envelope of AM signal along with its frequency spectrum

          e. Calculate the power in carrier and sidebands

    ii.   Derive the relation for power in AM signal in terms of the carrier power.