QP Code : 14577

(3 Hours)   [Total Marks : 80

N.B :   (1) Question no. **one** is **compulsory**.
       (2) Solve any **three** out of remaining questions.
       (3) Assume suitable data if required.

1.   Solve the following :—   **20**
      (a) Mention five important specifications of ADC/DAC that are looked at while selecting them for any application.
      (b) Discuss the factors that influence modulation index of an FM wave.
      (c) Draw FET based Hartley and Colpitt Oscillator. What is the frequency of oscillation if
         (i) $L1 = 10$ mH, $L2 = 10$ mH and $C = 0.1\,\mu F$ for Hartley tank circuit
         (ii) $L = 10$ mH, $C1 = 0.1\,\mu F$ and $C2 = 0.1\,\mu F$ for Colpitt tank circuit.
      (d) A public address system is connected to a microphone that has a maximum output voltage of 10mV. The microphone is connected to a 10 watt audio amplifier system that is driving an 8 Ohm speaker. The voltage amplifier is a noninverting op-amp circuit. Calculate the maximum voltage gain for the voltage amplifier stage and determine the resistor values to obtain the desired gain. Assume the power amplifier stage has a voltage gain of 1.

2.   (a) With proper circuit diagrams and transfer characteristics indicating Q-points do   **10**
         comparison of JFET bias circuits in detail.
      (b) Find R1 and R2 in the lossy integrator so that the peak gain is 20 dB and the gain is   **10**
         3 dB down from its peak when $\omega = 10{,}000$ rad/s. Use capacitance of $0.01\,\mu F$.

3.   (a) Sketch a block representation for an n-channel JFET, showing bias voltages,   **10**
         depletion regions, and current directions. Label the device terminals and explain its operation. Explain the effect of increasing levels of negative gate-source voltage. Also sketch a typical drain characteristics for $V_{GS} = 0$ for an n-channel JFET. Explain the shape of the characteristic, identify the regions, and indicate the important current and voltage levels.
      (b) Draw the spectrum of an amplitude modulated wave and explain its components.   **5**
      (c) Draw and explain opamp non inverting comparator. Draw input and output   **5**
         waveforms for Vref positive and also for Vref negative.

4.   (a) Explain the working of a superheterodyne receiver with the help of a neat block   **10**
         diagram. Show the waveforms at the output of each block.
      (b) What is DSBSC wave? Explain its generation using balanced modulator.   **10**

GN-Con. 8076-14.

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