

Time:-3 Hrs

Marks: 80



N.B. : 1. Question **ONE** is **compulsory**

2. Solve any **THREE** out of remaining questions

3. Draw neat and clean diagrams

4. Assume suitable data if required.

- Q. 1. A. Find the mathematical expression of FM signal 5
- B. With neat diagram explain Zero-Crossing Detector 5
- C. 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 is 1. 5
- D. Explain lock range and capture range. 5
- Q. 2 A. Sketch a block representation for an n-channel JFET, showing bias voltages, 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. 10
- B. List down various parameters of Opamp along with their typical values for IC741. Also explain what the significance of CMRR and Slew Rate is? 10
- Q. 3 A. Explain how operational amplifier can be used for taking summation of three signals. 5
- B. Explain fly wheel effect in Class C amplifier. 5
- C. Explain Nyquist criteria. 5
- D. Determine the magnitude of g_m for a JFET with $I_{DSS} = 8 \text{ mA}$ and $V_P = -4 \text{ V}$ at dc bias points $V_{GS} = -0.5 \text{ V}$ and also at $V_{GS} = -2.5 \text{ V}$. 5

- Q. 4 A. What is DSBSC wave? Explain its generation using balanced modulator. 10
B. Explain the use of PLL as FM detector. 10
- Q. 5 A. Explain super heterodyne receiver in detail along with the waveforms at each stage. 10
B. What do you understand by signal multiplexing? Explain TDM and FDM with suitable examples. 10
- Q. 6 A. Write short note on generation of FM by Armstrong method. 5
B. Mention important specifications of ADC and DAC required for communication. 5
C. Explain in detail what is meant by quantization noise. 5
D. Compare n-channel and p-channel JFET with respect to their device features and voltage-current characteristics. 5