

**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.P. Code: 23887**

- 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**