Q.P. Code :13161

[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. Question.No.1 is compulsory.
2. Solve any three questions from the remaining.
3. Assume suitable data if necessary.
4. Figures to the right indicate full marks.

Q.1 a) Compare integrator & differentiator. **05**

b) Define input offset voltage, output offset voltage, input bias current & input offset current for op-amp. **05**

c) Explain any five specifications of the digital to analog converter (DAC). **05**

d) Describe the basic block diagram of the phase locked Loop (PLL). **05**

Q.2 a) Derive the expression of inverting & the non-inverting amplifier using op-amp (Av) & design them both for $|AV|=10$ **10**

b) Derive the output voltage (V_o) expression of op-amp three input averaging circuit. **10**

Q.3 a) Design 2nd order KRC Low pass filter (LPF) for cut-off frequency fo=10 kHz with quality factor (Q) of 5. **10**

b) Design 1st order high pass filter for a cut-off frequency fo=2 kHz with unity gain. How will you modify the design to achieve low pass filter (LPF) operation? **10**

Q.4 a) Describe the parallel comparator/ flash type analog to digital convertor (ADC) with a neat diagram. **10**

b) Explain the operation of inverting Schmitt Trigger with neat diagram, input & output waveforms with transfer characteristics. **10**

Q.5 a) Design Monostable multivibrator using IC 555 to generate a time delay of T=500 ms. Assume + V_{cc}=10V. **10**

b) Design a positive voltage regulator to generate Vo=+5V with $Io = 50mA$ by using IC LM 723. Draw neat diagram of the designed circuit. **10**

Q.6 Write short notes on **(any four):-**

a) 3 stage R-C phase shift oscillator using op-amp.

b) Triangular waveform generator using op-amp.

c) Precision Rectifier using op-amp.

d) Log-Antilog amplifier using op-amp.

e) Voltage controlled oscillator (VCO)
