CBCS SCHEME

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17EE46

Fourth Semester B.E. Degree Examination, July/August 2021
Operational Amplifiers and Linear ICs

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions.*
2. *Any missing data may be assumed suitably.*

1 a. What is an op-amp? Explain the block diagram representation of a typical op-amp. **(08 Marks)**

b. Define the following electrical parameter as,
(i) Input offset voltage
(ii) CMRR
(iii) Slew rate. **(06 Marks)**

c. Briefly explain the difference between the dc and ac amplifier with a suitable circuit. **(06 Marks)**

2 a. What are the characteristics of an ideal op-amp? **(04 Marks)**

b. What is an instrumentation amplifier? Explain the instrumentational amplifier using transducer bridge resistance. Obtain the output voltage in terms of changing in resistance of the transducer. **(10 Marks)**

c. Explain the summing amplifier in any mode operation. Show that output voltage of a summing is equal to $\frac{1}{3}^{rd}$ of all input voltages. **(06 Marks)**

3 a. Define an active filters. Explain the first order low pass butter worth filter with a frequency response. **(06 Marks)**

b. Design a single stage band pass filter to have unity voltage gain and a pass band from 300 Hz to 30 Hz. **(08 Marks)**

c. Explain the following terms referred to the voltage regulator (i) line regulation (ii) Load regulation and Ripple rejection. **(06 Marks)**

4 a. What are the advantages of an active filler over passive filter? **(04 Marks)**

b. Sketch the circuit of a voltage follower regulator using op-amps. Explain the circuit operation. **(08 Marks)**

c. Using LM317 ICs, design an adjustable voltage regulator to satisfy the following specifications:
Output voltage V_0 = 5 to 12 volt
Input current I_0 = 1.0 Amp
(Assume I_{ADJ} = 100 μA, V_{ref} = 1.25 volt) **(08 Marks)**

5 a. Sketch the circuit of a triangular / rectangular waveform generator. Draw the output waveforms and explain the circuit operation. **(08 Marks)**

b. Design a phase shift oscillator to have an output of 3.5 KHz. Use 741 IC op-amp with supply voltage of ±12V . **(07 Marks)**

c. Draw the circuit diagram for an op-amp inverting zero cross detector with waveforms and explain its operation. **(05 Marks)**

6 a. Use a 741 IC op-amp, design an inverting Schmitt trigger circuit to trigger at $\pm 2V$ input and produce a ± 11 V output. **(08 Marks)**
b. Draw and explain the working voltage to current converter with grounded load. **(06 Marks)**
c. Draw a neat diagram and explain the operation of an inverting Schmitt trigger circuit. Draw its hysteresis curve. **(06 Marks)**

7 a. Design a nonsaturating precision half wave rectifier to a produce a 2 V peak output from a 1 MHz sinewave input a 0.5 V peak value. Use a bipolar op-amp with a supply voltage of ± 15 V. **(06 Marks)**
b. With a neat circuit diagram, explain precision full wave rectifier as combination of a summing circuit and half wave rectifier. Draw the input and output waveform. **(08 Marks)**
c. Draw the block diagram and waveform for a linear ramp type ADC. Explain its operation with waveforms. **(06 Marks)**

8 a. Discuss the advantage of a precision rectifier over an ordinary diode rectifier. **(04 Marks)**
b. With a neat circuit diagram, explain the working of 3 bit R-2R DAC. Draw a output versus inputs. **(08 Marks)**
c. Draw a neat block diagram of the successive-approximation type ADC. **(08 Marks)**

9 a. Draw the block diagram and waveform for a PLL (Phase-Locked Loop) system. Explain its function. **(06 Marks)**
b. Draw and explain the functional block diagram of a 555 timer for each component parts. **(08 Marks)**
c. Briefly explain the roles of a low pass filter and VCO in PLLs. **(06 Marks)**

10 a. Using the 555 timer, design a monostable multivibrator an output pulse width of 100 ms. **(08 Marks)**
b. Explain the working of the monostable multivibrator as a pulse stretcher using 555 ICs. **(06 Marks)**
c. Write a short notes on : (i) Phase detector (ii) PLL performance factors. **(06 Marks)**

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