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Question Paper Code : 30142

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023

Fourth Semester

Electronics and Communication Engineering

EC 3451 – LINEAR INTEGRATED CIRCUITS

(Common to : Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the equivalent circuit of practical op-amp.
2. Define slew rate. What causes the slew rate?
3. Sketch the circuit of current to voltage converter using op-amp.
4. What is the output of sign changer circuit?
5. Define capture range and lock range of PLL.
6. Draw the circuit of AM detector using PLL.
7. Calculate the values of LSB and MSB for an 8-bit DAC for 0V to 10V range.
8. Which is the fastest ADC and why?
9. Mention the features of isolation amplifier.
10. State the applications of multivibrator.

PART B — (5 × 13 = 65 marks)

11. (a) With necessary sketch and derivation, explain the different parameters of DC and AC characteristics of an op-amp.

Or

- (b) (i) Explain the methods for increasing the input resistance of an op-amp. (7)
(ii) An op-amp has a slew rate of $2V/\mu s$. Find the rise time, maximum frequency and full power bandwidth for an output voltage of 10V amplitude. (6)
12. (a) (i) Draw the circuit of integrator using op-amp and explain. (7)
(ii) Describe the operation of a differential amplifier with neat sketch. (6)

Or

- (b) (i) Explain half wave precision rectifier with neat circuit diagram. (7)
(ii) Describe the working of active peak detector using op-amp. (6)
13. (a) Describe the operation of a variable transconductance multiplier circuit. Also derive the expression for its output voltage.

Or

- (b) Determine the change in DC control voltage V_c during lock, if input signal frequency, $f_s = 20$ KHz, the free running frequency is 21 KHz and the V/F transfer coefficient of VCO is 4 KHz.
14. (a) Construct the functional diagram of the dual slope ADC and explain with its integrated output waveform. Also compare dual slope ADC with successive approximation ADC.

Or

- (b) Calculate the step change in output voltage on input varying from 0000 to 1111 for a 4-bit R-2R ladder DAC converter. Assume the full-scale voltage is 16V.

15. (a) Draw the functional block diagram of low voltage and high voltage regulator using IC 723 and explain. Also explain, how current boosting, current foldback and current limit protection is provided.

Or

- (b) Illustrate and explain the functional diagram of LM380 power amplifier.

PART C — (1 × 15 = 15 marks)

16. (a) (i) In an Astable multivibrator using IC 555 timer, $R_A = 6.8 k\Omega$, $R_B = 3.3 k\Omega$ and $C = 0.1 \mu F$. Calculate the free running frequency. (8)
(ii) Design a square wave generator using IC 555 timer for a frequency of 120 Hz and 60% duty cycle. Assume $C = 0.2$ microfarad. (7)

Or

- (b) Design an Instrumentation amplifier whose gain can be varied continuously over the range $1 \leq A \leq 1000$. Assume all other relevant details.