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Question Paper Code : 80527

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fourth Semester

Electronics and Communication Engineering

EC 8453 – LINEAR INTEGRATED CIRCUITS

(Common to : Biomedical Engineering / Medical Electronics /
Robotics and Automation)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Recall the ideal characteristics of basic operational amplifier.
2. Sketch the pin diagram of TL082 IC.
3. Calculate feedback resistance of an operational amplifier with a gain of -5 and input resistance $10\text{ K}\Omega$.
4. Design a I order Butterworth active low pass filter for 1 kHz cut-off frequency using inverting mode Op.Amp.
5. Draw the circuit of Gilbert multiplier cell.
6. Define transconductance.
7. Which is fastest ADC? How is it fast?
8. Find the time taken to convert 8 bit digital data into analog voltage using SAR and Counter ADC with the clock frequency of 1 KHz .
9. Determine the duty cycle of an astable multivibrator using 555 timer with $R_A = 4.7\text{ k}\Omega$, $R_B = 1\text{ k}\Omega$, $C = 1\text{ }\mu\text{F}$.
10. Mention any four features of 1CL8038 function generator.

PART B — (5 × 13 = 65 marks)

11. (a) Sketch the circuit of a Widlar current mirror and derive the expression for its output current. Mention the importance of current mirrors.

Or

- (b) Identify any two AC performance characteristics of Operational amplifiers. Explain the characteristics with suitable circuits.

12. (a) Derive an expression for output voltage of differentiator and integrator using operational amplifier.

Or

- (b) State the importance of instrumentation amplifiers in medical industry. With neat sketch explain the working of instrumentation amplifier. Also derive output expression.

13. (a) What are the internal blocks of PLL? Explain the operation of basic PLL and discuss any two applications in detail.

Or

- (b) Explain the function of analog multiplier and discuss its any two applications in detail.

14. (a) Explain the working of voltage and current mode R-2R ladder type D/A Converters with suitable expressions. Compare their conversion efficiency.

Or

- (b) With a suitable example, explain the working of successive approximation A/D converter. Compare the conversion times of tracking and successive approximation ADCs.

15. (a) Demonstrate the production of square and triangular waves using operational amplifiers with suitable circuits. Explain its operation in detail.

Or

- (b) Discuss the role of IC 723 as low voltage and high voltage regulator with appropriate circuits and expressions.

PART C — (1 × 15 = 15 marks)

16. (a) Design II order Butterworth active band pass filters with a lower cut off frequency of 200Hz and higher cut off frequency of 1KHz.

Or

- (b) Calculate free running frequency, lock range and capture range of PLL IC whose external timing resistor, $R_T = 15 K\Omega$, external timing capacitor, $C_T = 0.01 \mu F$, filter capacitor, $C_2 = 1 \mu F$ and supply voltage $\pm 6V$. Sketch the block diagram of PLL IC 565 with the above external components to operate as phase locked loop.
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