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Question Paper Code: 44304

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Fourth Semester

Electrical and Electronics Engineering

14UEE404 - ANALOG INTEGRATED CIRCUITS

(Common to Instrumentation and Control Engineering)

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- JFET is similar to that of fabrication of
 - Diode fabrication
 - FET fabrication
 - BJT fabrication
 - None of the above
- The greater the propagation delay, the _____
 - Lower the maximum frequency
 - Higher the maximum frequency
 - Maximum frequency is unaffected
 - Minimum frequency is unaffected
- Specified value of CMRR for 741 opamp is
 - 30 dB
 - 40 dB
 - 90 dB
 - 120 dB
- What is the scale multiplier (factor) of a basic integrator?
 - R/C
 - C/R
 - RC
 - 1/RC
- An instrumentation amplifier uses
 - 1 op-amp
 - 2 op-amps
 - 4 op-amps
 - 3 op-amps

6. In a sample and hold circuit the following statement is false
- (a) Sample time is much smaller than hold time
 - (b) Aperture time is the delay between the time that the pulse is applied to the switch and the actual time the switch closes
 - (c) Acquisition time is the time it takes for the capacitor to charge from one voltage to another voltage
 - (d) The voltage across the hold capacitor changes by 50% during hold time
7. Which of the following techniques are used for the analog multipliers?
- (a) Logarithmic multipliers
 - (b) Variable trans-conductance multipliers
 - (c) Both (a) and (b)
 - (d) None of these
8. How many V_{cc} connections does the 565 PLL use?
- (a) 0
 - (b) 1
 - (c) 2
 - (d) 3
9. Many types of IC regulator chips are available, some of which provide fixed voltages, while other can be
- (a) Programmed
 - (b) Biasing voltage
 - (c) Non-programmed
 - (d) None of these
10. A major advantage of all switching regulators is
- (a) Low Noise
 - (b) High Output Impedance
 - (c) High Efficiency
 - (d) All the above

PART - B (5 x 2 = 10 Marks)

11. List the technology used for fabrication of IC's.
12. Define slew rate in op-amp.
13. List the applications of Log amplifier.
14. Enumerate the features of 555 Timer Integrated Circuits.
15. Mention the limitations of linear IC voltage regulators. What is the order of the voltage drop across the current limiting resistor in an IC regulator when the limiting action occurs.

PART - C (5 x 16 = 80 Marks)

16. (a) Explain the fundamental method of monolithic IC technology. (16)

Or

b) Briefly explain the various processes involved in the fabrication of monolithic bipolar transistor. (16)

17. (a) With the necessary diagrams, describe the working principles of different external frequency compensation methods. (16)

Or

(b) (i) The Common Mode Rejection Ratio (CMRR) of an Op-amp is 10^4 . Two sets of signals are applied to it. First set is $V_1 = +20 \mu\text{V}$, $V_2 = -20 \mu\text{V}$ and second set $V_1 = 540 \mu\text{V}$, $V_2 = 500 \mu\text{V}$. Calculate the percent difference in output voltage for the two sets of signals. (6)

(ii) Design an op-amp differentiator that will differentiate an input signal with $f_{\text{max}} = 100 \text{ Hz}$. Draw the output waveform for a sine wave of 1 V peak at 100 Hz applied to the differentiator. Also repeat the same for a square wave input. (10)

18. (a) (i) What is an Instrumentation Amplifier? Draw a system whose gain is controlled by an adjustable resistance. Name the circuit that is used to detect the peak value of the non-sinusoidal waveforms. (8)

(ii) Draw the circuit of a voltage to current converter if the load is floating and grounded. Is there any limitation on the size of the load when grounded? Discuss. (8)

Or

(b) (i) Derive the mathematical expression for the output voltage of Logarithmic amplifier using three op-amps only with neat diagram and its operation in a detailed manner. (10)

(ii) An 8-bit A/D converter accepts an input voltage signal of range 0 to 10 V. What is the minimum value of the input voltage required to generate a change of 1 LSB? What input voltage will generate all 1's at the A/D converter output? Also find the digital output for an input voltage of 4.8 V. (6)

19. (a) Describe the working principle voltage controlled oscillator and derive the equation (16)

Or

(b) Draw the block schematic diagram of PLL IC NE/SE 565 and describe its functions. (16)

20. (a) Draw and explain the functional block diagram of the LM-317 three terminal adjustable regulator. (16)

Or

(b) (i) Mention the different configurations of a switching regulator. Draw any one basic block diagram and discuss its operation in detail. (8)

(ii) With a neat schematic diagram, describe a monolithic IC Audio power amplifier (LM 380). State its advantages over conventional power amplifiers. (8)