PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKE UP EXAMINATION – JAN 2023

Course Code: ECE 3001
Course Name: Linear Integrated Circuits
Program: B.Tech (ECE)

Date: 24-Jan-2023
Time: 01:00pm to 04:00pm
Max Marks: 60
Weightage: 30%

Instructions:
(i) Read the all questions carefully and answer accordingly.
(ii) Use of scientific (non – programmable) calculators is permitted

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Part A [Memory Recall Questions]

Answer all the Questions. Each question carries one mark.   **(9Qx 1M= 09M)**

1. An instrumentation amplifier is usually employed to amplify low-level signals, rejecting noise and interference signals. Which of the following is a desirable quality of an instrumentation amplifier?

    (a) High Output Impedance   (b) A CMRR of Zero
    (b) High Input Impedance   (c) Able to vary gain using two controls

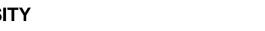   (C.O.No.1) [Knowledge]

2. Schmitt trigger devices are typically used in signal conditioning applications to remove noise from signals used in digital circuits. A Schmitt trigger is _____.

    (a) A Comparator with only one trigger point   (b) Comparator with hysteresis
    (b) Comparator with three trigger points   (d) A Non-comparator with hysteresis

                                                         (C.O.No.2) [Knowledge]

3. Advantage of an active filter is that they are economical or cost-effective. Unlike passive filter circuits, Active Filter Circuits require power supply. A filter that has two stop bands_____.

    (a) Low Pass Filter   (b) only Band Elimination Filter
    (b) High Pass Filter   (d) Band Elimination Filter & Band Pass Filter

                                                         (C.O.No.2) [Knowledge]

4. In a basic integrator, the element in the feedback will be a(an) _____.

    (a) Capacitor   (b) Resistor   (c) Op-amp   (d) Voltage Source

                                                         (C.O.No.1) [Knowledge]

5. The slope in the pass band of a second order high pass filter will be

   (a) -40 dB/decade   (b) 40 dB/decade   (c) 20 dB/decade (d) -20 dB/decade
                                                           (C.O.No.2) [Knowledge]

6. An inverting summing amplifier with gain 1 has different input voltages: 1.2V, 3.2V and 4.2V. Find the output voltage _____.   (C.O.No.2) [Knowledge]

7. Communication systems use filters to suppress undesired signals to pass through. The gain of the third order low pass filter in stop band decreases by _____ dB/decade.
                                                           (C.O.No.3) [Knowledge]

8. R-2R ladder DAC circuit is most commonly used to converts digital data to analog signals. A 3-bit ladder has a digital input of 110, V_{ref} of +10V. Its output voltage will be _____.   (C.O.No.3) [Knowledge]

9. Rectifier circuits are used to convert AC signal to DC. Which of the following isn't a type of rectifier?
     (a) Precision Half-wave Rectifier
     (b) Bridge Rectifier
     (c) Peak Rectifier
     (d) None of the mentioned   (C.O.No.2) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries SEVEN marks.   **(3Qx7M=21M)**

10. Opamps are used in varieties of applications due to its unique features. To represent an Opamp for its good features, it is been expressed in terms of various parameters. Explain briefly any four parameters of Op-amp.   (C.O.No.1) [Comprehension]

11. Opamps have very good characteristics like high input impedance, high gain and low output impedance, hence many applications uses opamps in designing the circuits. It is required to have an audio amplifier where the output is invert of input signal. Estimate an inverting amplifier circuit to have a voltage gain of 28dB and output voltage of 2.5V. Use a 741 Opamp.

12. Digital to analog Converters and analog to digital converter are used in a variety of applications that require data acquisition. Summarize the working of 8 bit SAR ADC along with neat circuit diagram.   (C.O.No.3) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries TEN marks.   **(3Qx10M=30M)**

13. Communication system uses filters to tune the radio signal and to suppress the noise. It is required to have a low pass filter at the receiver of FM radio. Compute the various components used in the 1st order low pass active filter circuit to have a cutoff frequency of 10 KHz with a gain of 2. Use 741 Opamp with VCC = ±12V   (C.O.No.2) [Application]

14. Signal generators are required in testing and characterization of electronic circuits. A device requires a symmetrical square wave for its operation. It is required to have a frequency of 1 KHz of symmetrical square wave for this device to operate. Illustrate a suitable circuit with proper design values for its components using Opamps to generate a symmetrical square wave. Assume that the power supply for Opamp is $\pm$ 10V.   (C.O.No.3) [Application]

15. Multiple key press detector system uses a circuit that produces a suitable analog voltage for every switch pressed. Consider a key pressed detector system has three switches S2, S1 & S0. Compute the analog output voltage produced by R-2R DAC circuit which is present in key pressed detector system for the following keys pressed (i) S2 & S0 (ii) S2, S1 & S0 along with suitable diagram. Assume the V_{ref} as 8V.   (C.O.No.3) [Application]