Enrollment No......................................

Faculty of Engineering
End Sem Examination May-2024
EC3CO17 Linear Integrated Circuits & Applications

Programme: B.Tech.   Branch/Specialisation: EC

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1   i.   Which of the following electrical characteristics is not exhibited   **1**
             by an ideal op-amp?
             (a) Infinite voltage gain   (b) Infinite bandwidth
             (c) Infinite output resistance   (d) Infinite slew rate

       ii.   Calculate the input offset current from the circuit shown below: **1**
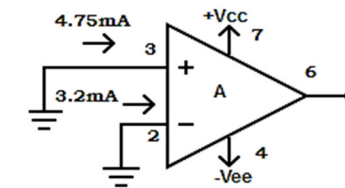
             (a) +1.55mA   (b) ±1.55mA
             (c) -1.55mA   (d) None of these

       iii. Define the input resistance with feedback for voltage series   **1**
             feedback amplifier-
             (a) RIF = R(1-AB)   (b) RIF = R(AB-1)
             (c) RIF = R(1+AB)   (d) None of these

       iv.   Find out the gain value by which each input of the averaging   **1**
             amplifier is amplified? (Assume there are four inputs)
   (a) 0.5   (b) 0.25   (c) 1   (d) 2

       v.   Match the gain of the filter with the frequencies in the low pass   **1**
             filter-
             Frequency   Gain of the filter
             1. f < fH   i. $V_O/V_{in} \cong A_F/\sqrt{2}$
             2. f=fH   ii. $V_O/V_{in} \leq A_F$
             3. f>fH   iii. $V_O/V_{in} \cong A_F$
             (a) 1-i,2-ii,3-iii   (b) 1-ii,2-iii,3-i
             (c) 1-iii,2-ii,3-i   (d) 1-iii,2-i,3-ii

vi. Find the roll-off rate for 8th order low pass filter-   **1**
(a) -160dB/decade   (b) -320dB/decade
(c) -480dB/decade   (d) -200dB/decade

vii. Determine the time period of a monostable 555 multivibrator-   **1**
(a) $T = 0.33RC$ (b) $T = 1.1RC$
(c) $T = 3RC$ (d) $T = RC$

viii. Calculate the hysteresis voltage for the schmitt trigger from the   **1**
given specification:
$R_2 = 56k\Omega$, $R_1 = 100\Omega$, Vref = 0v & $V_{sat} = \pm14v$.
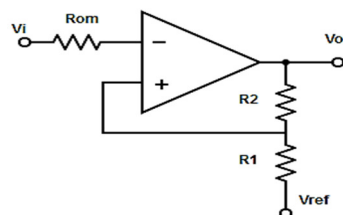

(a) 0 mv   (b) 25 mv   (c) 50 mv   (d) -25 mv

ix. The 7812 regulator IC provides-   **1**
(a) 5V   (b) -5V   (c) 12V   (d) -12V

x. Which is not considered as a linear voltage regulator?   **1**
(a) Fixed output voltage regulator
(b) Adjustable output voltage regulator
(c) Switching regulator
(d) Special regulator

Q.2   i.   What is Op-Amp?   **2**
    ii.   Design an inverting amplifier with gain of -5 and an input   **3**
        resistance of 10KΩ.
    iii.   Define following electrical parameters of Op-Amp: Input offset   **5**
        voltage, CMRR, Output Voltage Swing, slew rate and SVRR.
OR   iv.   List and explain the function of all the basic building block of an   **5**
   Op-Amp.

Q.3   i.   What is feedback? List two types of feedback. Which type is used   **2**
        in linear application?
    ii.   Draw circuit diagram of an integrator, explain its working, drive   **3**
        the expression of output and draw the output waveform for square
        wave input.
    iii.   What is instrumentation amplifier? Draw its circuit diagram and   **5**
        drive the expression of output also write its applications.

OR   iv.   Draw and explain the circuit diagram of phase shift oscillator, and   **5**
        also design it for output frequency of 200Hz.

Q.4   i.   Define Filter. How are filter classified?   **2**
    ii.   What are the advantages of active filters over passive filters?   **3**
    iii.   Design a first order low pass butterworth filter so that it has a cut   **5**
        off frequency of 1.6KHz and a pass band gain of 2.
OR   iv.   Consider the following filter circuit and calculate the low cut-off   **5**
        frequency value and draw the frequency response of filter.
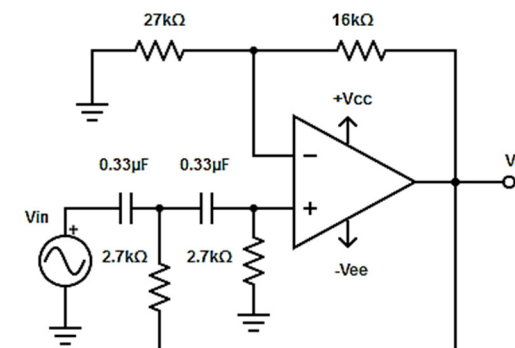
Q.5   i.   Draw and explain the functional diagram of a 555 timer.   **4**
    ii.   Identify the circuit given below, explain its working and   **6**
        determine the output waveform for the given sinusoidal input.
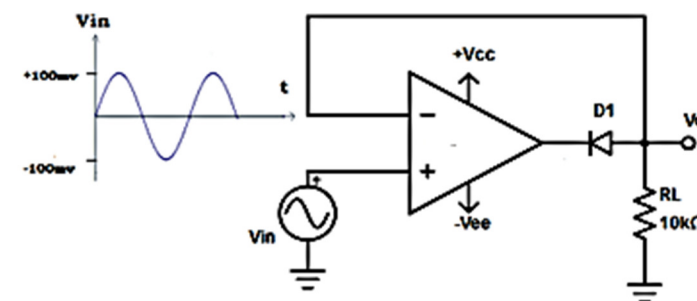
OR   iii.   What is peak detector draw its circuit diagram and explain its   **6**
        working with input output wave forms.

Q.6   Attempt any two:
    i.   What is switching regulator? List major component of switching   **5**
        regulator and explain there working.
    ii.   Write short note on SMPS.   **5**
    iii.   What is fixed and adjustable voltage regulator list the advantage   **5**
        of adjustable voltage regulator over fixed voltage regulator.

******

Marking Scheme

Linear Integrated Circuits & Applications (T) - EC3CO17 (T)

Q.1	i)	c. Infinite output resistance		**1**
	ii)	a. +1.55mA		**1**
	iii)	c. $R_{IF} = R(1+AB)$		**1**
	iv)	b. 0.25		**1**
	v)	d. 1-iii,2-i,3-ii		**1**
	vi)	a. -160dB/decade		**1**
	vii)	b. $T = 1.1RC$		**1**
	viii)	c. 50 mv		**1**
	ix)	c. 12V		**1**
	x)	c. Switching regulator		**1**

Q.2	i.	Definition-	2 Marks	**2**
	ii.	Circuit Diagram-	1 Marks	**3**
		Formula Derivation-	1 Marks	
		For Rf Value-	1 Marks	
	iii.	Each Parameter Defining-	1*5= 5 Marks	**5**
OR	iv.	Block Diagram-	2 Marks	**5**
		Explanations-	3 Marks	

Q.3	i.	Definition of feedback-	1 Marks	**2**
		Types of feedback-	0.5 Marks	
		Which feedback used in linear application-	0.5 Marks	
	ii.	Circuit Diagram-	0.5 Marks	**3**
		Working-	0.5 Marks	
		Expression derivation-	1 Marks	
		Input out waveform-	1 Marks	
OR	iii.	defining instrumentation amplifier-	0.5 Marks	**5**
		circuit diagram-	2 Marks	
		expression of output- 2 Marks		
		Applications- 0.5 Marks		

Q.4	i.	Defining Filter-	1 Marks	**2**
		Filter classification	1 Marks	
	ii.	Circuit diagram	2 Marks	**5**
		Frequency Response	1 Marks	
		Finding the value of components according to the given value of cut off frequency and pass band gain-	2 Marks	

OR	iii.	Cut off frequency derivation-	3 Marks	**5**
		Frequency response-	2 Marks	
Q.5	i.	Diagram-	2 Marks	**4**
		Explanation -	2 Marks	
	ii.	Identification of circuit -	1 Marks	**6**
		Working Explanation-	3 Marks	
		output waveform -	2 Marks	
OR	iii.	What is peak detector-	1 Marks	**6**
		circuit diagram -	2 Marks	
		working-	2 Marks	
		Input output wave forms	1 Marks	
Q.6				
	i.	What is switching regulator-	2 Marks	**5**
		List major component-	1 Marks	
		Working-	2 Marks	
	ii.	Circuit diagram-	2 Marks	**5**
		Explanation	3 Marks	
	iii.	What is fixed and adjustable voltage regulator -	3 Marks	**5**
		advantage -	2 Marks	

***** *****