Code No: RT31026 **R13** SET - 1

III B. Tech I Semester Regular Examinations, November - 2015
LINEAR & DIGITAL IC APPLICATIONS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Make a comparison between an ideal Op-amp and a practical Op-amp.	[4M]
	b)	Explain the different methods used to increase the input resistance of an op-amp.	[4M]
	c)	Define the Op-Amp parameters: (i) Input offset voltage, V_{io} (ii) Input bias current, I_{io}.	[3M]
	d)	Write about 566 voltage controlled oscillator.	[4M]
	e)	Differentiate between active and passive filters.	[3M]
	f)	List important specifications of Digital to Analog converters indicating their typical values.	[4M]

PART –B

2	a)	The common mode input of a certain differential amplifier, having differential gain of 125 is 4 sin 200πt V. determine the common mode output if CMMR 60dB.	[4M]
	b)	Analyze a dual input and unbalanced output BJT differential amplifier.	[8M]
	c)	For an op-amp PSRR is 70dB (min), CMRR is 10^5 and $A_d = 10^5$. The output voltage changes by 20V in 4 sec. Calculate (i) common mode gain (ii) slew rate.	[4M]
3	a)	An Op-Amp has a slew rate of 2V/μ sec. What is the maximum frequency of an output signal of peak value 5V at which the distortion sets in due to the slew rate limitation?	[4M]
	b)	Explain the parameters that should be considered for ac and dc applications of an Op-Amp.	[8M]
	c)	Draw a neat circuit diagram of an integrator circuit. Explain its functioning with the Input-Output wave forms.	[4M]
4	a)	What are the three differential amplifier configurations? Compare and contrast these configurations.	[8M]
	b)	What is an instrumentation amplifier? Draw a three Op-Amp dc instrumentation amplifier and derive the expression for its output.	[8M]
5	a)	Draw the circuit of an Astable multivibrator using Op-Amp and derive the expression for its frequency of oscillations. How will you modify this circuit to have independent control of ON and OFF time durations?	[8M]
	b)	What is a three terminal regulator? Draw a fixed voltage regulator circuit and explain its operation. Explain how the IC 7805 can be used as a current source.	[8M]

6 a) With the aid of a circuit diagram, explain the principle of operation of second-order low pass active filter. [8M]

b) Draw a band – pass filter circuit with its frequency response curve. Explain its working. [8M]

7 a) Draw the circuit diagram of dual slope integration A to D converter and state its advantages. Explain its operation with waveforms. What parameters decide its conversion speed and accuracy? [8M]

b) Discuss the following type ADCs: [8M]
i) Ramp type ADC and ii) Servo tracking ADC.

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Code No: RT31026 **R13** SET - 2

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3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Briefly explain about FET differential amplifier.	[3M]
	b)	Explain the term 'Slew rate' and how it affects the frequency response of an Op-Amp.	[4M]
	c)	Explain tracking range and capture range of a PLL.	[4M]
	d)	Explain how IC 7805 can be used as a current source.	[4M]
	e)	Draw the frequency response characteristics of a notch filter.	[3M]
	f)	Define the terms 'Accuracy', 'Percentage Resolution' and 'settling time' of an Analog to Digital converter.	[4M]

PART -B

2	a)	Draw the circuit of BJT differential amplifier and suggest ways to improve CMRR.	[4M]
	b)	Consider a BJT current mirror with a nominal current transfer ratio of unity. Let the transistors have Is = 10^{-15}A, β =100 and V_A=100V.For I_{REF} =1mA find I_0 when V_O = 5V also find the output resistance.	[8M]
	c)	Write about level translator circuit.	[4M]
3	a)	Define the terms: PSRR, CMRR, input bias current & input offset voltage. Explain the difference between slew rate and transient response.	[3M]
	b)	Write about 78XX–79XX voltage regulators and explain about their use in dual power supply.	[8M]
	c)	Draw and explain the working of an op amp with offset-voltage compensating network.	[5M]
4	a)	With the help of a neat circuit diagram, explain the working of a logarithmic amplifier. Derive the expression for its output voltage.	[8M]
	b)	Draw the circuit of an Astable multivibrator using Op-Amp and derive the expression for its frequency of oscillations. How will you modify this circuit to have independent control of ON and OFF time durations?	[8M]
5	a)	Discuss with relevant circuits and waveforms the working of Monostable multivibrator using 555 timer.	[8M]
	b)	Draw the block diagram of a 565 PLL IC and explain its working.	[8M]

6 a) Explain the operation of an All-pass filter. Explain why it is known as phase shift circuit. [8M]

b) Design a band-pass active filter of second order with a mid-band voltage gain AR VR=50. Center frequency fR 0R=200 Hz and Bandwidth=20 Hz. [8M]

7 a) Write a short note on performance specifications of a digital to analog converter. [8M]

b) Draw the circuit of weighted resistor DAC and derive expression for output analog voltage Vo. [8M]

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Code No: RT31026 **R13** SET - 3

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Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Draw the BJT current mirror circuit and briefly explain its operation.	[4M]
	b)	Explain the different methods used to increase the input resistance of an op-amp.	[4M]
	c)	Sketch and explain the circuit operation of log and antilog amplifiers.	[4M]
	d)	Derive expression for o/p voltage 'V_0' of dual -slope A/D converter.	[4M]
	e)	Explain different configurations of an active filter.	[3M]
	f)	Compare different types of ADCs.	[3M]

PART -B

2	a)	Draw the block diagram of the operational amplifier and briefly write about each block.	[8M]
	b)	Analyze the circuit of a BJT differential amplifier with emitter resistance.	[8M]
3	a)	Write about large signal voltage gain of op-amp.	[3M]
	b)	Define the Op-Amp parameters: (i) Input offset voltage, Vio (ii) Input bias current, Iio with a practical setup explain how these parameters can be measured.	[8M]
	c)	Explain frequency compensation techniques used in Op-Amps.	[5M]
4	a)	Design a differentiator to differentiate an input signal thatvaries in frequency from 10 Hz to about 1 KHz. If a sinewave of 1 V peak at 1000 Hz is applied to this differentiator, draw the output waveforms.	[8M]
	b)	Define the terms Upper and Lower Tripping Points of a Schmitt trigger. What is the significance of the two parameters? Explain the operation of a Schmitt trigger circuit using Comparator.	[8M]
5	a)	Draw the circuit of 555 timer IC in Astable mode to get output waveform with 50% duty cycle.	[6M]
	b)	Define the terms: i) free-running frequency f_0 , (ii) lock range, (iii) capture range, and (iv) pull-in time, pertaining to PLL.	
6	a)	Explain the term 'frequency scaling' with suitable example.	[8M]
	b)	Design a wide band pass filter with f_L = 200 Hz, f_H = 1KHz and a pass band gain = 4. Draw the frequency response and calculate 'Q' factor for the filter.	[8M]
7	a)	Explain the operation of a multiplying DAC and mention its applications.	[8M]
	b)	Describe AD 670 microprocessor compatible flash converter.	[8M]

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Write about current repeater circuits.	[3M]
	b)	For an op-amp having slew rate of 3 V/ μsec, what is the maximum closed loop voltage gain that can be used when the input signal varies by 0.4V in 12 μ sec.	[4M]
	c)	Draw and explain the ideal voltage transfer characteristics of an op-amp.	[3M]
	d)	Write briefly about FSK demodulators.	[4M]
	e)	Explain the function of Wide band reject filter.	[4M]
	f)	Write about the basic Digital to Analog Conversion techniques.	[4M]

PART -B

2	a)	Explain the operation of the BJT differential amplifier with constant current source.	[4M]
	b)	Analyze the BJT differential amplifier with dual input and balanced output.	[8M]
	c)	Write about cascade differential amplifier.	[4M]
3	a)	Write about the large signal operation of an op-amp.	[3M]
	b)	Write about the advantages and disadvantages of 78xx and 79xx series regulators.	[8M]
	c)	Draw and explain the working of an op amp with offset-voltage compensating network.	[5M]
4	a)	Define the terms Upper and Lower Tripping Points of a Schmitt trigger. What is the significance of the two parameters? Explain the operation of a Schmitt trigger circuit using Comparator.	[8M]
	b)	Draw a neat circuit diagram of an integrator circuit. Explain its functioning with the Input-Output wave forms. Derive the output voltage V_0 of an integrator circuit.	[8M]
5	a)	What is the principle of PLL? Draw the block schematic and explain the same.	[8M]
	b)	Discuss about any two applications of 555 timer monostable multivibrator.	[8M]
6	a)	Design a second order low-pass Butterworth filter with a cut-off frequency of 12KHz and unity gain at low frequency. Also determine the voltage transfer function magnitude in dB at 15Hz for the filter.	[8M]
	b)	Given a bandpass filter with resonant frequency fr of 1000 Hz and a bandwidth of 3000Hz; Find its (i) quality factor, (ii) lower cutoff frequency and higher cutoff frequency.	[8M]
7	a)	Sketch and explain the transfer characteristic of a DAC with necessary equations.	[7M]
	b)	Give the schematic circuit diagram of successive approximation type A/D converter and explain the operation of this system.	[9M]

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