Course Code: 23EC0412 R23

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: A&D IC Applications (23EC0412) **Course & Branch**: B.Tech – ECE

Year &Sem: III-B.Tech & I-Sem **Regulation:** R23

UNIT –I
ICS AND OP-AMPS

PART-A (2 MARKS)

1	a)	Define an Integrated Circuit.	[L1][CO1]	2M
	b)	Classify different types of ICs.	[L1][CO1]	2M
	c)	State any two characteristics of an ideal Op-Amp.	[L1][CO1]	2M
	d)	What is input offset voltage?	[L1][CO1]	2M
	e)	Define Common Mode Rejection Ratio.	[L1][CO1]	2M

PART-B (10 MARKS)

2	a)	What are the advantages of integrated circuits over discrete component.	[L1][CO1]	5M
	b)	Explain about the levels of integrations.	[L2][CO1]	5M
3	a)	Draw the pin configuration of IC 741 op-amp and describe each pin.	[L1][CO1]	5M
	b)	Discuss the advantages of having infinite input impedance, infinite open loop gain, and zero output impedance for the op-amp.	[L2][CO1]	5M
4	a)	Explain the operation of practical open loop op-amp with suitable circuit.	[L2][CO1]	5M
	b)	Explain about Common mode signal.	[L2][CO1]	5M
5		Draw the internal block diagram of op-amp and describe each block in detail.	[L1][CO1]	10M
6	a)	With an appropriate circuit diagram explain about basic differential amplifier.	[L2][CO1]	6M
	b)	For an Op-Amp, CMRR & Differential mode gain is 10^5. The output voltage changes by 20V in 4μS. Calculate (i) Common Mode gain (ii) Slew rate.	[L3][CO1]	4M
7	a)	Discuss about the operation of buffer and level shifter used in the op-amp.	[L2][CO1]	5M
	b)	Determine the output voltage of a differential Amplifier for the input voltages of 300μV & 240μV. The Differential gain of the amplifier is 5000. The value of the CMRR is 100.	[L3][CO1]	5M
8	a)	Explain about the output stage of the op-amp.	[L2][CO1]	5M
	b)	Determine the output voltage of a differential Amplifier for the input voltages of 400μV & 340μV. The Differential gain of the amplifier is 5000. The value of the CMRR is 100.	[L3][CO1]	5M
9	a)	List the DC characteristics of the op-amp and explain each one in detail.	[L2][CO1]	5M
	b)	An operational amplifier has $A_{OL} = 2\times10^5$, input offset voltage = 3mV and CMRR = 90dB. (i) Calculate the common-mode gain. (ii) Determine the output due to a differential input of 40 μV and common-mode input of 0.5 V.	[L3][CO1]	5M
10	a)	Briefly explain about the AC characteristics of the op-amp.	[L2][CO1]	5M
	b)	For an Op-Amp, CMRR & Differential mode gain is 10^3. The output voltage changes by 30V in 6μS. Calculate (i) Common Mode gain (ii) Slew rate.	[L3][CO1]	5M
11	a)	Write the features of IC 741 op-amp.	[L1][CO1]	5M
	b)	An operational amplifier has $A_{OL} = 3\times10^4$, input offset voltage = 2mV and CMRR = 80dB. (i) Calculate the common-mode gain. (ii) Determine the output due to a differential input of 60 μV and common-mode input of 0.8 V.	[L3][CO1]	5M

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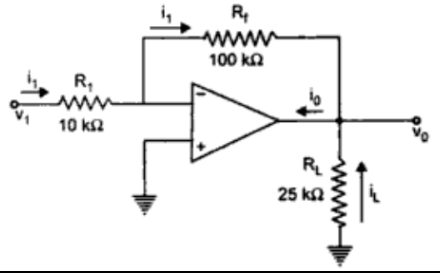
UNIT –II
APPLICATIONS OF OP-AMP

PART-A (2 MARKS)

1	a)	What is an inverting amplifier?	[L1][CO2]	2M
	b)	Define a sample and hold circuit.	[L1][CO3]	2M
	c)	Define Virtual Ground Property.	[L1][CO2]	2M
	d)	Define comparator.	[L1][CO3]	2M
	e)	What is a Schmitt Trigger?	[L1][CO3]	2M

PART-B (10 MARKS)

2	a)	Derive the equation of the gain of an op-amp inverting amplifier.	[L3][CO2]	5M
	b)	In the circuit shown below, R_1=10kΩ, R_f=100kΩ, V_i=1V. A load of 25kΩ is connected to the output terminal. Calculate I_1, V_0, I_L, and total current I_0 into the output pin. 	[L3][CO2]	5M
3	a)	With appropriate circuit explain the operation Non-inverting amplifier and find its gain.	[L2][CO2]	6M
	b)	Design an amplifier with a gain of +5 and feedback resistor of 40kΩ using one op-amp.	[L3][CO2]	4M
4	a)	What is differential amplifier? Explain the operation of op-amp differential amplifier.	[L2][CO2]	5M
	b)	Design an adder circuit using an op-amp to get the output expression as $v_0 = -(0.1v_1 + v_2 + 10v_3)$.	[L3][CO2]	5M
5	a)	Explain how a basic differential amplifier circuit can be used as a subtractor.	[L2][CO2]	5M
	b)	Discuss how an op-amp can be used to measure and control physical quantities.	[L2][CO2]	5M
6	a)	Describe about inverting and non-inverting AC amplifiers.	[L2][CO2]	5M
	b)	Explain how voltage can be converted to current using op-amp.	[L2][CO2]	5M
7	a)	Show how op-amp differentiate a signal.	[L1][CO2]	5M
	b)	With neat sketch explain about sample and hold circuit. Show its input-output waveforms.	[L2][CO3]	5M
8	a)	Briefly explain the operation of op-amp log amplifier.	[L2][CO3]	5M
	b)	Explain how two signals can be multiplied and divide using op-amp.	[L2][CO3]	5M
9	a)	Show the process of comparing two signals using op-amp.	[L1][CO3]	5M
	b)	What is regenerative comparator? With neat circuit explain in detail.	[L2][CO3]	5M
10	a)	Describe the operation of op-amp as astable multivibrator.	[L2][CO3]	5M
	b)	Show how an op-amp can generate triangular waveform.	[L1][CO3]	5M
11	a)	Describe the operation of op-amp as monostable multivibrator.	[L2][CO3]	5M
	b)	What is an oscillator? Discuss how an op-amp can function as oscillator.	[L2][CO3]	5M

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UNIT –III
ACTIVE FILTERS AND OTHER ICS
PART-A (2 MARKS)

1	**a)**	Define filter?	**[L1][CO4]**	**2M**
	b)	Define cut-off frequency.	**[L1][CO4]**	**2M**
	c)	Write the applications of IC555 timer.	**[L1][CO4]**	**2M**
	d)	What is Phase Locked Loop?	**[L1][CO4]**	**2M**
	e)	Write the function of a phase detector.	**[L1][CO4]**	**2M**

PART-B (10 MARKS)

2	**a)**	What is filter? Briefly explain about RC active filters.	**[L2][CO4]**	**4M**
	b)	Design a first order low pass Butterworth filter using Op-Amp and find its higher cut-off frequency.	**[L3][CO4]**	**6M**
3	**a)**	Discuss about a second order active high pass filter.	**[L2][CO4]**	**5M**
	b)	What is band pass filter? Describe about narrow band pass filter.	**[L2][CO4]**	**5M**
4	**a)**	Describe about wide band pass filter.	**[L2][CO4]**	**5M**
	b)	What is band reject filter? Explain about narrow band reject filter.	**[L2][CO4]**	**5M**
5	**a)**	With neat sketch explain about wide band reject filter in detail.	**[L2][CO4]**	**5M**
	b)	Discuss about all pass filter.	**[L2][CO4]**	**5M**
6	**a)**	Draw the pin diagram of IC555 timer and describe each pin.	**[L2][CO4]**	**5M**
	b)	With neat sketch explain the functional block diagram of IC555 timer.	**[L2][CO4]**	**5M**
7	**a)**	Explain the working principle of a monostable multivibrator using IC555 with neat circuit diagram and timing pulses.	**[L2][CO4]**	**7M**
	b)	What are the applications of monostable multivibrator?	**[L2][CO4]**	**3M**
8	**a)**	Describe the operation of astable multivibrator using IC555 timer.	**[L2][CO4]**	**7M**
	b)	What are the applications of astable multivibrator?	**[L1][CO4]**	**3M**
9	**a)**	Illustrate Schmitt Trigger circuit using IC555 and explain its operation.	**[L2][CO4]**	**5M**
	b)	Draw the block diagram Phase Locked Loops (PLL) and explain each block in detail.	**[L2][CO4]**	**5M**
10	**a)**	Describe the operation of PLL as a analog phase detector.	**[L2][CO4]**	**6M**
	b)	Design a Low pass filter at a cutoff frequency of 10kHz with a passband gain of 2.	**[L3][CO4]**	**4M**
11	**a)**	What is Voltage Controlled Oscillator (VCO)? Explain in detail.	**[L2][CO4]**	**6M**
	b)	Design a Notch filter to eliminate 120Hz hum.	**[L3][CO4]**	**4M**

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UNIT –IV
VOLTAGE REGULARS AND CONVERTERS
PART-A (2 MARKS)

1	**a)**	State need for voltage regulator.	**[L1][CO5]**	**2M**
	b)	Define resolution of DAC.	**[L1][CO5]**	**2M**
	c)	Define conversion time of ADC.	**[L1][CO5]**	**2M**
	d)	Compare R-2R and weighted ADC.	**[L1][CO5]**	**2M**
	e)	What is switching regulator?	**[L1][CO5]**	**2M**

PART-B (10 MARKS)

2	**a)**	Explain about the Series Op-Amp Regulator.	**[L2][CO5]**	**5M**
	b)	What is IC voltage regulator? List their characteristics.	**[L1][CO5]**	**5M**
3	**a)**	Draw the pin diagram of IC723. Design a low-voltage regulator using IC723.	**[L3][CO5]**	**6M**
	b)	Describe about switching regulator.	**[L2][CO5]**	**4M**
4	**a)**	With a schematic diagram explain the DAC technique.	**[L2][CO5]**	**5M**
	b)	An 8-bit DAC has an output voltage range of (0-2.55V). Define its resolution.	**[L1][CO5]**	**5M**
5	**a)**	Design a 3-bit weighted resistor DAC and explain its transfer characteristics.	**[L2][CO5]**	**5M**
	b)	The digital input for a 4-bit DAC is 0110. Calculate its final output voltage given V_{OFS}=15V.	**[L3][CO5]**	**5M**
6	**a)**	Design a 3-bit R-2R DAC and explain its operation.	**[L3][CO5]**	**6M**
	b)	The basic step of a 9-bit DAC is 10.3 mV. If "000000000" represents 0V. What output is produced if the input is "101101111"?	**[L3][CO5]**	**4M**
7	**a)**	Discuss the inverted R-2R ladder DAC.	**[L2][CO5]**	**5M**
	b)	What output voltage would be produced by a DAC whose output range is 0 to 10V & whose input binary no. is (i)10 (ii) 0110 (iii) 10111100	**[L3][CO5]**	**5M**
8	**a)**	With block diagram explain the function of ADC.	**[L2][CO5]**	**5M**
	b)	Discuss about the parallel comparator ADC.	**[L2][CO5]**	**5M**
9	**a)**	With neat sketch explain how the counter type ADC works.	**[L2][CO5]**	**5M**
	b)	Calculate the values of LSB and MSB and full-scale output for an 8-bit DAC for the 0 to 10V range.	**[L3][CO5]**	**5M**
10	**a)**	Draw the circuit diagram of dual Slope ADC and explain its working.	**[L2][CO5]**	**6M**
	b)	For a Dual slope ADC V_R=100mv t_1=50msec and clock frequency is 12kHz find the digital output for an input voltage of 200mv.	**[L3][CO5]**	**4M**
11	**a)**	Explain the operation of successive approximation type ADC.	**[L2][CO5]**	**6M**
	b)	An 8-bit has resolution of 20mv/LSB. Find its V_{OFS} and V_O if the input is $(10000000)_2$	**[L3][CO5]**	**4M**

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UNIT –V
DIGITAL ICS

PART-A (2 MARKS)

1	**a)**	State CMOS logic levels.	**[L1][CO6]**	**2M**
	b)	Draw CMOS inverter.	**[L1][CO6]**	**2M**
	c)	Define priority encoder.	**[L1][CO6]**	**2M**
	d)	Differentiate MUX and DEMUX.	**[L1][CO6]**	**2M**
	e)	State applications of shift registers.	**[L1][CO6]**	**2M**

PART-B (10 MARKS)

2	**a)**	Describe the working of MOS transistors.	**[L2][CO6]**	**5M**
	b)	Explain the working principle of basic CMOS inverter.	**[L2][CO6]**	**5M**
3	**a)**	Design 3-input NAND and NOR gates in CMOS logic and explain their functional table.	**[L3][CO6]**	**5M**
	b)	Implement half adder in CMOS logic and state its functional table.	**[L3][CO6]**	**5M**
4	**a)**	Draw the circuit of OR-AND-INVERTER in CMOS logic and state its functional table.	**[L1][CO6]**	**5M**
	b)	Implement full adder SUM logic equation in CMOS logic and state its functional table.	**[L3][CO6]**	**5M**
5	**a)**	Draw the circuit of AND-OR-INVERTER in CMOS logic and state its functional table.	**[L1][CO6]**	**5M**
	b)	Implement full adder CARRY logic equation in CMOS logic and state its functional table.	**[L3][CO6]**	**5M**
6	**a)**	Write the Applications of TTL-74XX & CMOS 40XX Series ICs	**[L1][CO6]**	**5M**
	b)	Discuss about binary to gray code converter.	**[L2][CO6]**	**5M**
7		Draw the block diagram of IC 74X138 decoder and explain its operations using functional table.	**[L2][CO6]**	**10M**
8		Draw the block diagram of IC 74X148 priority encoder and explain its operations using functional table.	**[L2][CO6]**	**10M**
9	**a)**	Explain the working principle of demultiplexer.	**[L2][CO6]**	**5M**
	b)	What is magnitude comparator? Explain in detail with an example.	**[L2][CO6]**	**5M**
10	**a)**	What is flip-flop? Discuss the working of JK flip-flop with truth table.	**[L2][CO6]**	**5M**
	b)	Discuss about synchronous 4-bit up counter.	**[L2][CO6]**	**5M**
11	**a)**	What is decade counter? Explain in detail with appropriate logic diagram and truth table.	**[L2][CO6]**	**5M**
	b)	Explain the working principle of Parallel in Serial out shift register.	**[L2][CO6]**	**5M**