INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**INTEGRATED CIRCUITS APPLICATIONS**
Course Code	:	**AEC008**
Program	:	**B.Tech**
Semester	:	**V**
Branch	:	**Electrical and Electronics Engineering**
Section	:	**A, B, C,D**
Academic Year	:	**2019 – 2020**
Course Faculty	:	**Ms. G Ajitha, Assistant Professor** **Ms. N Anusha, Assistant Professor** **Mr. S Lakshmanachari, Assistant professor** **Ms. P Saritha, Assistant Professor** **Ms. KS Indrani, Assistant Professor**

OBJECTIVES:

I	Be acquainted to principles and characteristics of op-amp and apply the techniques for the design of comparators, instrumentation amplifier, integrator, differentiator, multivibrators, waveform generators, log and anti-log amplifiers.
II	Analyze and design filters, timer, analog to digital and digital to analog Converters.
III	Understand the functionality and characteristics of commercially available digital integrated circuits.

DEFINITIONS AND TERMINOLOGY QUESTION BANK:

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT-I						
1	Define an Integrated circuit.	An integrated circuit(IC) is a miniature, low cost electronic circuit consisting of active and passive components fabricated together on a single crystal of silicon.	Remember	CO 1	CLO 1	AEC008.01
2	What are the advantages of IC over discrete components?	•Miniaturization •Cost reduction • Increased system reliability • Increased functional performance • Increased operating speed • Reduction in power consumption.	Remember	CO 1	CLO 1	AEC008.01
3	What are the different IC packages?	There are three different packages available. • Metal can package • Ceramic flat package • Dual-in-line package	Remember	CO 1	CLO 1	AEC008.01
4	Define an operational amplifier.	An operational amplifier is a direct-coupled, high gain amplifier consisting of one or more differential amplifier.	Remember	CO 1	CLO 1	AEC008.01
5	What are the ideal	* Open loop voltage gain is infinity. * Input impedance is infinity.	Remember	CO 1	CLO 3	AEC008.03

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	characteristics of Op-amp?	* Output impedance is zero. *Bandwidth is infinity. *Zero offset.				
6	Why constant current source is used instead of R_E ?	Effect of higher value of R_E is provided by a constant current source circuit due to which common mode gain becomes very small and due to which CMRR becomes very high.	Understand	CO 1	CLO 3	AEC008.03
7	What happens when the common terminal of V+ and V- sources is not grounded?	If the common point of the two supplies is not grounded, twice the supply voltage will get applied and it may damage the op-amp.	Understand	CO 1	CLO 1	AEC008.01
8	Define input offset voltage	It is defined as the voltage that must be applied between the input terminals of an op-amp to nullify the output.	Remember	CO 1	CLO 1	AEC008.01
9	Define input offset current	It is defined as the algebraic difference between the current entering the inverting and non-inverting terminal of an op-amp.	Remember	CO 1	CLO 1	AEC008.01
10	Define CMRR of an op-amp	The relative sensitivity of an op-amp to a difference signal as compared to a common mode signal is called the common –mode rejection ratio	Remember	CO 1	CLO 1	AEC008.01
11	Define slew rate.	Slew rate can be defined as the maximum rate of change of output voltage of op-amp with respect to time.	Remember	CO 1	CLO 1	AEC008.01
12	What causes slew rate?	The rate at which the internal or external capacitance of an op-amp charges causes slew rate.	Understand	CO 1	CLO 1	AEC008.01
13	Why IC 741 is not used for high frequency applications?	IC741 has a low slew rate because of the predominance of capacitance present in the circuit at higher frequencies. As frequency increases the output gets distorted due to limited slew rate.	Understand	CO 1	CLO 1	AEC008.01
14	What is Dual Input Balanced Output	When two input signals are applied to base of transistor, it is said to be Dual Input. When both collectors are at same DC potential with respect to ground, then it is said to be Balance Output.	Understand	CO 1	CLO 2	AEC008.02
15	Define Differential Gain of Differential Amplifier?	When the difference of the two inputs applied to the two terminals of a differential amplifier is amplified, the resultant gain is termed as differential gain	Remember	CO 1	CLO 2	AEC008.02
16	Why Does An Op-amp have High CMRR	High CMRR ensures that the common mode signals such as noise are rejected successfully and the output voltage is proportional only to the differential input voltage.	Understand	CO 1	CLO 1	AEC008.01
18	What are the Parameters That Should Be Considered For Dc Applications?	The parameters to be considered for dc applications are: Input offset voltage, Input offset current, Input bias current, Drift	Remember	CO 1	CLO 1	AEC008.01
19	What are the Parameters That	The parameters to be considered for ac applications are: Gain bandwidth	Remember	CO 1	CLO 1	AEC008.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	Should Be Considered For Ac Applications?	product (GBW),Rise time, Slew rate, Full-power response, AC noise				
20	What are the properties of symmetrical emitter coupled differential amplifier?	Low drift because of symmetrical IC Construction, very high input resistance, Two inputs(an inverting and a non-inverting amplifier),high CMRR.	Remember	CO 1	CLO 2	AEC008.02
21	What Is Perfect Balance In Op Amp?	Perfect balance is the characteristics of ideal OP AMP and if there is same input applied then we will get the output zero. In this condition it is known as perfect balance.	Remember	CO 1	CLO 2	AEC008.02
22	What is the classification of ICs based on complexity level?	Small Scale Integration Medium Scale Integration Large scale Integration Very Large Scale Integration	Remember	CO 1	CLO 1	AEC008.01
23	What is the classification of ICs based on fabrication process?	Depending on the fabrication process IC are classified as 1)Monolithic IC 2)Hybrid IC	Remember	CO 1	CLO 1	AEC008.01
24	What produces more offset voltage at the output?	Input bias current produces more offset voltage at the output.	Remember	CO 1	CLO 1	AEC008.01
25	What are the typical values for an IC741?	Input bias current:500nA Input offset current:200nA Input offset voltage:500Mv	Remember	CO 1	CLO 1	AEC008.01
26	Name the 741opamp with high slew rate?	741S is a military grade op-amp with a higher slew rate.	Remember	CO 1	CLO 1	AEC008.01
27	Define input bias current?	It is defined as the average of the current entering into the input terminals of an op-amp.	Remember	CO 1	CLO 1	AEC008.01
28	Define Power supply rejection ratio?	It is defined as the ratio of the change in input offset voltage due to change in supply voltage producing it , keeping other power supply voltage constant .	Remember	CO 1	CLO 1	AEC008.01
29	What is the amplifier used at the output stage of op-amp block diagram?	The output stage is a complementary symmetry push-pull amplifier.	Remember	CO 1	CLO 2	AEC008.02
30	Define Thermal drift?	The average rate of change of input offset voltage per unit change in temperature is called thermal voltage drift.	Remember	CO 1	CLO 1	AEC008.01
31	What is the typical range of CMRR?	60dB≤ CMRRdB ≤120 dB	Remember	CO 1	CLO 1	AEC008.01
32	What are factors that changes op-amp parameters?	1)Temperature 2) Supply voltage change 3) Time.	Remember	CO 1	CLO 1	AEC008.01
33	How can the slew rate be made faster?	The slew rate can be made faster by having a high charging current or a small capacitance value.	Understand	CO 1	CLO 1	AEC008.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
34	What are various configurations of a differential amplifier?	Dual input balanced output Dual input unbalanced output Single input balanced output Single input unbalanced output	Remember	CO 1	CLO 2	AEC008.02
35	What is differential amplifier?	A differential amplifier is one which amplifies the difference between its two input signals. The gain with which it amplifies the difference is called differential gain.	Remember	CO 1	CLO 2	AEC008.02
36	What is active load?	The current mirror circuit used as a collector load resistance is called an active load.	Remember	CO 1	CLO 3	AEC008.03
37	What is the typical value of PSRR for IC 741 op-amp?	IC 741 op-amp PSRR is 30μV/V	Remember	CO 1	CLO 1	AEC008.01
38	What are the desirable properties of output stage of op-amp block diagram?	Large output voltage swing capability , large output current swing capability, low output resistance, short circuit protection.	Understand	CO 1	CLO 3	AEC008.03
39	What is common mode gain of a differential amplifier?	The factor by which differential amplifier amplifies the common mode signal is called its common mode gain.	Remember	CO 1	CLO 1	AEC008.01
40	What is the function of level shifter?	It is used after the intermediate stage to shift the dc level at the output of intermediate stage downward to zero volts with respect to ground.	Understand	CO 1	CLO 2	AEC008.02
UNIT-II						
1	Define Inverting Amplifier.	Inverting Amplifier is a normal op-amp in which the output is given as feedback to the inverted terminal of input by means of a feedback resistor.	Understand	CO 2	CLO 4	AEC008.04
2	What is Non-inverting amplifier?	Non-inverting amplifier is “the operational amplifier in which the output is in phase with input signal”.	Remember	CO 2	CLO 4	AEC008.04
3	Define Amplication.	Amplification means a process to increase signal strength by means of amplitude.	Understand	CO 2	CLO 4	AEC008.04
4	Define Summing Amplifier.	The Summing Amplifier is another type of operational amplifier circuit configuration that is used to combine the voltages present on two or more inputs into a single output voltage.	Understand	CO 2	CLO 4	AEC008.04
5	Define Gain.	Amplifier gain is simply the ratio of the output signal divided-by the input signal.	Understand	CO 2	CLO 4	AEC008.04
6	Define Accuracy.	Accuracy can be defined as the amount of uncertainty in a measurement with respect to an absolute standard.	Understand	CO 2	CLO 4	AEC008.05
7	Define DC offset.	DC offset is the unwanted DC output voltage which appears at the output of the op-amp in addition to the desired signal.	Understand	CO 2	CLO 4	AEC008.05
8	What is input bias current?	The input bias current IB is the average of the current entering the input	Remember	CO 2	CLO 4	AEC008.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		terminals of a balanced amplifier i.e. IB = (IB1 + IB2) / 2.				
9	Define CMRR.	Common mode rejection ratio (CMRR) of a differential amplifier (or other device) is a metric used to quantify the ability of the device to reject common-mode signals, i.e. those that appear simultaneously and in-phase on both inputs.	Understand	CO 2	CLO 4	AEC008.05
10	What is Monolithic IC?	Monolithic integrated circuit is a set of electronic circuits on one small flat piece of semiconductor material, normally silicon.	Remember	CO 2	CLO 4	AEC008.04
11	Define Amplifier.	An amplifier is an electronic device that increases the voltage, current, or power of a signal.	Understand	CO 2	CLO 4	AEC008.05
12	Define frequency response.	It is a measure of magnitude and phase of the output as a function of frequency, in comparison to the input.	Understand	CO 2	CLO 4	AEC008.05
13	What is voltage follower?	A voltage follower is an electronic circuit, which produces an output that follows the input voltage.	Remember	CO 2	CLO 4	AEC008.04
14	What is linear component?	Any component which will follow the ohm's law is a linear component otherwise non linear.	Remember	CO 2	CLO 4	AEC008.04
15	What is non-linear?	Any component which will not follow the ohm's law is a non-linear component.	Remember	CO 2	CLO 4	AEC008.05
16	Define integrator.	An integrator is an electronic circuit that produces an output that is the integration of the applied input.	Understand	CO 2	CLO 4	AEC008.04
17	Define differentiator.	A differentiator is an electronic circuit that produces an output equal to the first derivative of its input.	Understand	CO 2	CLO 4	AEC008.04
18	What is comparator?	Comparator is a circuit which compares a signal voltage applied at one input of an op-amp with a known reference voltage at the other input.	Remember	CO 2	CLO 4	AEC008.05
19	Define feedback.	Feedback is the process of feeding some portion of output signal to the input signal.	Understand	CO 2	CLO 4	AEC008.04
20	Define positive feedback.	Positive feedback is the process of feeding some portion of output signal to the input signal in phase.	Understand	CO 2	CLO 4	AEC008.04
21	Define negative feedback.	Negative feedback is the process of feeding some portion of output signal to the input signal 1800 out of phase.	Understand	CO 2	CLO 4	AEC008.04
22	Define upper threshold voltage (VUT).	In a Schmitt trigger, the voltages at which the output switches from +Vsat to –Vsat.	Understand	CO 2	CLO 4	AEC008.05
23	Define lower threshold voltage (VLT).	In a Schmitt trigger, the voltages at which the output switches from -Vsat to +Vsat.	Understand	CO 2	CLO 4	AEC008.05
24	Define hysteresis.	The difference between the UTP and LTP points is called hysteresis.	Understand	CO 2	CLO 4	AEC008.05
25	Define multivibrator.	Multivibrators are two stage switching circuits in which the output of the first stage is fed to the input of the second state and vice-versa. The outputs of two	Understand	CO 2	CLO 4	AEC008.05

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		stages are complementary.				
26	Define astable multivibrator.	A stable vibrator is a circuit with an oscillating output. It doesn't need any external triggering, and it has got no stable state.	Understand	CO 2	CLO 4	AEC008.05
27	Define monostable multivibrator.	A monostable multivibrator is the type of multivibrator circuit whose output is in only one stable state.	Understand	CO 2	CLO 4	AEC008.05
28	Define stable state.	It is the state in which the device can stay permanently and only when a proper external triggering signal is applied; it will change its state.	Understand	CO 2	CLO 4	AEC008.05
29	Define quasi-stable state.	It is a temporarily stable state. The device will automatically come out of quasi stable state after a pre defined time period.	Understand	CO 2	CLO 4	AEC008.05
30	Define biasing.	Biasing is the process of application of external voltage in order to operate the device in a desired way.	Remember	CO 2	CLO 4	AEC008.05
31	What is the input impedance of a non-inverting amplifier?	Input impedance of a non- inverting amplifier is extremely large (= ∞) as the op-amp draws negligible current from the signal source.	Remember	CO 2	CLO 4	AEC008.04
32	What is thermal drift?	Thermal drift is the changes in the normal operational behavior of a device due to changes in ambient temperature.	Understand	CO 2	CLO 4	AEC008.05
33	What is Input offset voltage?	This is the voltage required to be amplified at the input for making output voltage to zero volts.	Remember	CO 2	CLO 4	AEC008.04
34	What is an instrumentation amplifier?	Instrumentation amplifier is defined as the special amplifier which is used for such a low level amplification with high CMRR, high input impedance to avoid loading, low power consumption and some other features is called an instrumentation amplifier.	Remember	CO 2	CLO 4	AEC008.05
35	Give any four important features of an instrumentation amplifier.	i. High gain Accuracy ii. High CMRR iii. High gain stability iv. Low dc offset	Remember	CO 2	CLO 4	AEC008.05
36	What is logarithmic amplifier?	A logarithmic amplifier, or a log amplifier, is an electronic circuit that produces an output that is proportional to the logarithm of the applied input.	Remember	CO 2	CLO 4	AEC008.05
37	What is anti-logarithmic amplifier?	An anti-logarithmic amplifier, or an anti-log amplifier, is an electronic circuit that produces an output that is proportional to the anti-logarithm of the applied input.	Remember	CO 2	CLO 4	AEC008.05
38	Define virtual short in op-amp?	For an op-amp, the voltage at the inverting input terminal is equal to the voltage at its non-inverting input terminal without physical connection between these two terminals.	Understand	CO 2	CLO 4	AC008.04
39	What is an adder in op-amp?	An adder is an electronic circuit that produces an output, which is equal to the sum of the applied inputs.	Remember	CO 2	CLO 4	AEC008.04
40	What is a	A subtractor is an electronic circuit that	Remember	CO 2	CLO 4	AEC008.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	subtractor in op-amp?	produces an output, which is equal to the difference of the applied inputs.				
		UNIT-III				
1	Define filter?	Filter is a frequency selective network that allows specified band of frequencies of signal and attenuates the signals of frequencies outside the band.	Understand	CO 3	CLO 6	AEC008.06
2	What is Active filter?	Active filters are the filters which use op amp as active component and resistors and capacitors as passive components.	Understand	CO 3	CLO 6	AEC008.06
3	What is Passive filter?	Passive filters are the filters which use resistors, capacitors and inductors as components	Understand	CO 3	CLO 6	AEC008.06
4	Define Low pass filter?	A low-pass filter (LPF) is a filter that passes signals with a frequency lower than a selected cutoff frequency and attenuates signals with frequencies higher than the cutoff frequency.	Remember	CO 3	CLO 6	AEC008.06
5	What is cut off frequency?	Cut off frequency is the frequency where gain falls to 0.707 times of pass band gain.	Understand	CO 3	CLO 6	AEC008.06
6	Define High pass filter?	A high-pass filter (HPF) is an electronic filter that passes signals with a frequency higher than a certain cutoff frequency and attenuates signals with frequencies lower than the cutoff frequency.	Remember	CO 3	CLO 6	AEC008.06
7	What is band pass filter?	A bandpass filter is an electronic device or circuit that allows signals between two specific frequencies topass, but that discriminates against signals at other frequencies.	Remember	CO 3	CLO 6	AEC008.06
8	Define Band reject filter?	A band-stop filter or band-rejection filter is a filter that passes most frequencies unaltered, but attenuates those in a specific range to very low levels.	Remember	CO 3	CLO 6	AEC008.06
9	What is All pass filter?	An all-pass filter is a signal processing filter that passes all frequencies equally in gain, but changes the phase relationship among various frequencies	Understand	CO 3	CLO 6	AEC008.06
10	Define transfer function of an active filter?	Transfer function of filter is defined as the ratio of output to input.	Remember	CO 3	CLO 6	AEC008.06
11	Define pass band of a filter?	A pass band is the range of frequencies or wavelengths that can pass through a filter.	Remember	CO 3	CLO 6	AEC008.06
12	What is stop band of filter?	A stop band is a band of frequencies, between specified limits, through which a circuit, such as a filter or telephone circuit, does not allow signals to pass, or the attenuation is above the required stop band attenuation level.	Understand	CO 3	CLO 6	AEC008.06
14	Define band width of active	Bandwidth is the difference between the upper and lower frequencies in a continuous band of frequencies. It is	Remember	CO 3	CLO 6	AEC008.06

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	filter?	typically measured in hertz				
15	What is ideal band width of high pass filter?	Ideal band width of high pass filter is infinite.	Understand	CO 3	CLO 6	AEC008.06
16	Define quality factor of band pass filter?	The Quality factor of a band pass filter is the ratio of the Resonant Frequency, (fr) to the Bandwidth, (BW) .	Remember	CO 3	CLO 6	AEC008.06
17	What is Notch filter?	A Notch filter is a band-stop filter with a narrow stop band (high Q factor).	Understand	CO 3	CLO 6	AEC008.06
18	Define wide band pass filter?	Band pass filter is defined as a wide band pass if its figure of merit or quality factor Q is less than 10 and it can be formed by simply cascading high-pass and low-pass sections.	Remember	CO 3	CLO 6	AEC008.06
19	What is Narrow band pass filter?	Band pass filter is defined as a Narrow band pass if its figure of merit or quality factor Q is greater than 10.	Understand	CO 3	CLO 6	AEC008.06
20	Define frequency scaling?	Frequency scaling IS defined as the change of cut off frequency to new frequency.	Remember	CO 3	CLO 7	AEC008.07
21	What is the roll off rate of a first order filter?	The first-order low-pass and high-pass filters, the gain rolls off at the rate of about 20dB/decade in the stop band.	Understand	CO 3	CLO 7	AEC008.07
22	Define 555 timer?	The 555 timer is a highly stable device for generating accurate time delay or oscillation.	Remember	CO 3	CLO 7	AEC008.07
23	What is difference between a Timer and a Counter ?	Difference between a Timer and a Counter. The register is incremented considering 1 to 0 transition at its corresponding to an external input pin (T0, T1). ...A timer uses the frequency of the internal clock, and generates delay. A counter uses an external signal to count pulses.	Understand	CO 3	CLO 7	AEC008.07
24	Define counter ?	Counter is a digital device and the output of the counter includes a predefined state based on the clock pulse applications.	Remember	CO 3	CLO 7	AEC008.07
25	Define comparator ?	A comparator is a device that compares two voltages or currents and outputs a digital signal indicating which is larger.	Remember	CO 3	CLO 7	AEC008.07
26	What is control flip flop ?	A flip-flop or latch is a circuit that has two stable states and can be used to store state information. A flip-flop is a bistable multivibrator.	Understand	CO 3	CLO 7	AEC008.07
27	What is pulse width of mono stable multi using 555 timer ?	The pulse width of mono stable multi is 1.1 RC.	Understand	CO 3	CLO 7	AEC008.07
28	Define trigger pulse?	A trigger pulse is an asynchronous event that causes a specific change in logical	Remember	CO 3	CLO 7	AEC008.07

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		state .				
29	What is missing pulse detector?	Missing pulse detector can be used to detect missing pulses in an incoming pulse train.	Understand	CO 3	CLO 7	AEC008.07
30	Define frequency divider?	A frequency divider, is a circuit that takes an input signal of a frequency f_{in} and generates an output signal of a frequency $f_{out} = f_{in}/n$. where n is an integer.	Remember	CO 3	CLO 7	AEC008.07
31	Define duty cycle of astable multi?	Duty cycle of astable multi is defined as the ratio of ON time to the total time period.	Remember	CO 3	CLO 7	AEC008.07
32	What are the units of bandwidth of an active filter?	The units of bandwidth of an active filter are Hertz.	Understand	CO 3	CLO 6	AEC008.06
33	Define pulse width modulation?	The pulse width modulation is defined as the pulse width is varied in accordance with the message signal.	Remember	CO 3	CLO 7	AEC008.07
34	What is pulse position modulation?	The pulse position modulation is defined as the change in pulse position in accordance with the message signal.	Understand	CO 3	CLO 7	AEC008.07
35	What are the modes of operation of 555 timer?	The modes of operation of 555 timer are astable mode and monostable mode.	Understand	CO 3	CLO 7	AEC008.07
36	Define phase locked loop?	A phase-locked loop or phase lock loop (PLL) is a control system that generates an output signal whose phase is related to the phase of an input signal.	Remember	CO 3	CLO 8	AEC008.08
37	What are the blocks of PLL?	The internal blocks of PLL are phase detector, low pass filter, an error amplifier and voltage controlled oscillator.	Understand	CO 3	CLO 8	AEC008.07
38	What are the applications of PLL?	The internal blocks of PLL are phase detector, low pass filter, an error amplifier and voltage controlled oscillator.	Remember	CO 3	CLO 8	AEC008.07
39	Define capture range of PLL?	Capture range is the frequency range in which the PLL acquires phase lock. Capture range is always smaller than the lock range.	Understand	CO 3	CLO 8	AEC008.07
40	Define Lock range of PLL?	Lock range(Tracking range): The lock range is defined as the range of frequencies over which the PLL system follows the changes in the input frequency $f_{IN.}$	Remember	CO 3	CLO 8	AEC008.07
		UNIT-IV				
1	How many types of Data converters are there what are	There are two types of data converters • Analog to Digital Converter • Digital to Analog Converter	Remember	CO 4	CLO 9	AEC008.09

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	they?					
2	Define Analog converter?	To connect the output of an analog circuit as an input of a digital circuit, then we have to place an interfacing circuit between them.	Remember	CO 4	CLO 9	AEC008.07
3	Define Digital converter?	To connect the output of a digital circuit as an input of an analog circuit, then we have to place an interfacing circuit between them.	Understand	CO 4	CLO 9	AEC008.07
4	Define Resolution?	Resolution is the minimum amount of change needed in an analog input voltage for it to be represented in binary (digital) output.	Understand	CO 4	CLO 9	AEC008.07
5	Define Conversion time?	The amount of time required for a data converter in order to convert the data (information) of one form into its equivalent data in other form is called as conversion time	Remember	CO 4	CLO 9	AEC008.07
6	What do you mean by analog to digital conversation time?	The amount of time required for an Analog to Digital Converter (ADC) to convert the analog input voltage into its equivalent binary (digital) output is called as Analog to Digital conversion time. It depends on the number of bits that are used in the digital output.	Understand	CO 4	CLO 9	AEC008.07
7	What do you mean by digital to analog conversation time?	The amount of time required for a Digital to Analog Converter (DAC) to convert the binary (digital) input into its equivalent analog output voltage is called as Digital to Analog conversion time.	Remember	CO 4	CLO 9	AEC008.07
8	How many types of DACs are available?	There are two types of DACs • Weighted Resistor DAC • R-2R Ladder DAC	Understand	CO 4	CLO 10	AEC008.010
9	What is weighted resistor DAC?	A weighted resistor DAC produces an analog output, which is almost equal to the digital (binary) input by using binary weighted resistors in the inverting adder circuit. In short, a binary weighted resistor DAC is called as weighted resistor DAC.	Remember	CO 4	CLO 10	AEC008.010
10	What do you mean by virtual short concept?	The voltage at the inverting input terminal of opamp is same as that of the voltage present at its non-inverting input terminal. So, the voltage at the inverting input terminal's node will be zero volts.	Understand	CO 4	CLO 9	AEC008.09
11	What is R-2R ladder?	The R-2R Ladder DAC overcomes the disadvantages of a binary weighted resistor DAC. As the name suggests, R-2R Ladder DAC produces an analog output, which is almost equal to the digital (binary) input by using a R-2R ladder network in the inverting adder circuit.	Remember	CO 4	CLO 10	AEC008.010
12	How many types of ADC are there	There are two types of ADCs: • Direct type ADCs	Understand	CO 4	CLO 9	AEC008.09

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	what are they?	• Indirect type ADC				
13	Define Direct type ADC?	If the ADC performs the analog to digital conversion directly by utilizing the internally generated equivalent digital (binary) code for comparing with the analog input, then it is called as Direct type ADC.	Understand	CO 4	CLO 9	AEC008.09
14	What are the examples of Direct type ADC	• Counter type ADC • Successive Approximation ADC • Flash type ADC	Remember	CO 4	CLO 9	AEC008.09
15	What is counter type ADC	A counter type ADC produces a digital output, which is approximately equal to the analog input by using counter operation internally.	Remember	CO 4	CLO 9	AEC008.09
16	What is successive approximation ADC	A successive approximation type ADC produces a digital output, which is approximately equal to the analog input by using successive approximation technique internally.	Understand	CO 4	CLO 9	AEC008.09
18	What is voltage divider network	A reference voltage VR is applied across that entire network with respect to the ground. The voltage drop across each resistor from bottom to top with respect to ground will be the integer multiples (from 1 to 8) of VR/8.	Understand	CO 4	CLO 9	AEC008.09
19	What is Indirect type ADC	If an ADC performs the analog to digital conversion by an indirect method, then it is called an Indirect type ADC. In general, first it converts the analog input into a linear function of time (or frequency) and then it will produce the digital (binary) output.	Remember	CO 4	CLO 9	AEC008.09
20	What is dual slope ADC	A dual slope ADC produces an equivalent digital output for a corresponding analog input by using two (dual) slope technique.	Remember	CO 4	CLO 9	AEC008.09
21	What the linearity of A/D or D/A?	The linearity of an A/D or D/A converter is a important measure of its accuracy and tells us how close the converter output is its ideal transfer characteristics.	Remember	CO 4	CLO 9	AEC008.09
22	Define differential non linearity?	An ADC and DAC Differential Non-Linearity (DNL) ... When that happens, the ADC's linearity is severely impacted. Therefore, DNL is defined as the maximum deviation from one LSB between two consecutive levels, over the entire transfer function	Understand	CO 4	CLO 10	AEC008.010
23	Define accuracy?	Accuracy can be defined as the amount of uncertainty in a measurement with respect to an absolute standard. Accuracy specifications usually contain the effect of errors due to gain and offset parameters.	Remember	CO 4	CLO 11	AEC008.011
24	Define monotonicity?	Monotonicity is a property of certain types of digital-to-analog converter (DAC) circuits. In a monotonic DAC, the	Remember	CO 4	CLO 11	AEC008.011

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		analog output always increases or remains constant as the digital input increases.				
25	Define settling time?	Settling Time is a very important parameter for every DAC and is defined as the time until the output voltage reaches and don't leaves again a defined voltage tolerance band.	Remember	CO 4	CLO 11	AEC008.011
26	Define Stability?	The ability of a DAC to produce a stable output all the time is called as Stability. The performance of a converter changes with drift in temperature, aging and power supply variations.	Remember	CO 4	CLO 11	AEC008.011
27	Name essential parts of DAC?	• Audio Signal Processing. • Basic Digital to Analog Converter. • Binary Weighted Resistors DAC. • R-2R Ladder Digital to Analog Converter (DAC) • Motor Control Application.	Understand	CO 4	CLO 9	AEC008.09
28	which is the fastest ADC and why	The most common types of ADCs are flash, successive approximation, and sigma-delta. The flash ADC is the fastest type available. A flash ADC uses comparators, one per voltage step, and a string of resistors. A 4-bit ADC will have 16 comparators, an 8-bit ADC will have 256 comparators.	Understand	CO 4	CLO 9	AEC008.09
29	Define the formula of resolution in the value of LSB?	resolution = $V_{FS}/2^n$-1 = 1LSB increment	Understand	CO 4	CLO 9	AEC008.09
30	Write the formula for calculating time period (T 1) in ADC	T1 =t_2-t_1 =2^n counts/clock rate	Understand	CO 4	CLO 9	AEC008.09
31	What do mean by staircase signal	The excitation signals include a DC bias potential increasing cyclically by a potential step to form a potential staircase signal sweeping across a potential domain, and a number of pulse trains either of opposite polarity or shifted in potential per potential step.	Understand	CO 4	CLO 9	AEC008.09
32	What do you mean by smoothing signal	In smoothing, the data points of a signal are modified so individual points (presumably because of noise) are reduced, and points that are lower than the adjacent points are increased leading to a smoother signal.	Understand	CO 4	CLO 9	AEC008.09
33	What is the output equation of DAC?	$V_o=KV_{FS}(d_1 2^{-1}+ d_2 2^{-2}+.....+ dn2^{-n)}$	Remember	CO 4	CLO 10	AEC008.010

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
34	List out some integrated type converters.	• Charge balanced ADC • Dual slope ADC	Remember	CO 4	CLO 9	AEC008.09
35	What is integrating type converter?	An ADC converter that perform conversion in an indirect manner by first changing the analg I/P signal to a linear function of time or frequency and then to a digital code is known as integrating type A/D converter.	Remember	CO 4	CLO 11	AEC008.011
36	Where the successive approximation type ADC used?	The successive approximation ADCs are used in applications such as data loggers & instrumentation where conversion speed is important.	Remember	CO 4	CLO 11	AEC008.011
37	What is multiplying DAC?	A digital to analog converter which uses a varying reference voltage V_R is called a multiplying DAC(MDAC). If the reference voltage of a DAC, V_R is a sine wavegive by $V(t)=V_{in}\text{Cos } 2f\ t$ Then, $Vo(t)=V_{om}\text{Cos}(2\ ft + 180)$	Remember	CO 4	CLO 11	AEC008.011
38	State the advantage of dual slope ADC?	It provides excellent noise reject of ac signal whose periods are integral multiples of the integration time	Remember	CO 4	CLO 11	AEC008.011
39	Define relative accuracy?	It is the maximum deviation after gain & offset errors have been removed.The accuracy of a converter is also specified in form of LSB increments or % of fullscale voltage	Understand	CO 4	CLO 11	AEC008.011
40	Define resolution of a data converter.	It is defined as the total time required to convert an analog signal into its digital output. It depends on the conversion technique used & the propagation delay of circuit components. The conversion time of a successive approximation type ADC is given by**T(n+1)** where T---clock period; Tc---conversion time; n----no. of bits	Understand	CO 4	CLO 11	AEC008.011
UNIT-V						
1	Define combinational circuit?	The output of combinational circuit at any instant of time, depends only on the levels present at input terminals.	Understand	CO 5	CLO 12	AEC008.012
2	Define half adder?	Half adder is a combinational logic circuit with two inputs and two outputs. The half adder circuit is designed to add two single bit binary number A and B	Understand	CO 5	CLO 12	AEC008.012
3	Define full adder?	Full adder is a combinational circuit that forms the arithmetic sum of three input bits. It consists of three inputs and two outputs. It can add two one-bit numbers A and B, and carry c.	Understand	CO 5	CLO 12	AEC008.012
4	Define N-Bit Parallel Adder.	To add two n-bit binary numbers the n-bit parallel adder is used. It uses a number of full adders in cascade. The carry output of the previous full adder is	Understand	CO 5	CLO 12	AEC008.012

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		connected to carry input of the next full adder.				
5	Define decoder.	A decoder is a combinational circuit. It has n input and to a maximum m = 2^n outputs. Decoder is identical to a demultiplexer without any data input. It performs operations which are exactly opposite to those of an encoder.	Remember	CO 5	CLO 12	AEC008.012
6	Define encoder.	Encoder is a combinational circuit which is designed to perform the inverse operation of the decoder. An encoder has n number of input lines and m number of output lines. An encoder produces an m bit binary code corresponding to the digital input number.	Remember	CO 5	CLO 12	AEC008.012
7	Define priority encoder	Priority encoder is a circuit that converts multiple binary inputs into binary representation of the index of active input bit with the highest priority. Each of input has assigned priority.	Remember	CO 5	CLO 12	AEC008.012
8	Define multiplexer.	Multiplexer is a special type of combinational circuit. There are n-data inputs, one output and m select inputs with 2^m = n. It is a digital circuit which selects one of the n data inputs and routes it to the output. The selection of one of the n inputs is done by the selected inputs.	Remember	CO 5	CLO 12	AEC008.012
9	Define demultiplexer.	A demultiplexer performs the reverse operation of a multiplexer i.e. it receives one input and distributes it over several outputs. It has only one input, n outputs, m select input.	Remember	CO 5	CLO 12	AEC008.012
10	Define comparator.	A comparator is a special combinational circuit designed primarily to compare the relative magnitude of two binary numbers.	Remember	CO 5	CLO 12	AEC008.012
11	Define sequential circuit.	A sequential circuit is a logical circuit, where the output depends on the present value of the input signal as well as the sequence of past inputs.	Understand	CO 5	CLO 13	AEC008.013
12	Define the classifications of sequential circuits.	The sequential circuits are classified on the basis of timing of their signals into two types. They are, 1) Synchronous sequential circuit. 2) Asynchronous sequential circuit.	Understand	CO 5	CLO 13	AEC008.012
13	Define Synchronous sequential circuit.	A synchronous circuit is a digital circuit in which the changes in the state of memory elements are synchronized by a clock signal.	Understand	CO 5	CLO 13	AEC008.012
14	Define universal	NAND and NOR gates are universal	Understand	CO 5	CLO 13	AEC008.012

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	gates.	gates. Because a combination of NAND gates or a combination of NOR gates can be used to perform functions of any of the basic logic gates				
15	Define Flip flop	The basic unit for storage is flip flop. A flip-flop maintains its output state either at 1 or 0 until directed by an input signal to change its state	Understand	CO 5	CLO 14	AEC008.014
16	Define operation of SR flip-flop?	When R input is low and S input is high the Q output of flip-flop is set. When R input is high and S input is low the Q output of flip-flop is reset. When both the inputs R and S are low the output does not change. When both the inputs R and S are high the output is unpredictable.	Understand	CO 5	CLO 14	AEC008.014
17	Define the operation of T flip-flop?	T flip-flop is also known as Toggle flip-flop. When T=0 there is no change in the output. When T=1 the output switch to the complement state (i.e) the output toggles.	Understand	CO 5	CLO 14	AEC008.014
18	Define race around condition.	In JK flip-flop output is fed back to the input. Therefore change in the output results change in the input. Due to this in the positive half of the clock pulse if both J and K are high then output toggles continuously. This condition is called race around condition'.	Understand	CO 5	CLO 14	AEC008.014
19	Define DC noise margin.	It is the maximum noise voltage added to an input signal of a digital circuit that does not cause an undesirable change in the circuit output. It is expressed in volts.	Understand	CO 5	CLO 14	AEC008.014
20	Define propagation delay.	propagation delay can also be defined as the time interval between changes in a defined logic level input and reflection of its effect at the output logic level.	Understand	CO 5	CLO 14	AEC008.014
21	Define fan-out.	Number of logic gates at the next stage that can be loaded to a given logic gate output so that voltages for each of the possible logic state remain within the defined limits	Understand	CO 5	CLO 13	AEC008.013
22	Define important characteristics of digital ICs?	Fan out, Power dissipation, Propagation Delay, Noise Margin , Fan In, Operating temperature ,Power supply requirements are the important characteristics of digital IC.	Understand	CO 5	CLO 13	AEC008.013
23	Define master-slave flip-flop.	A master-slave flip-flop consists of two flip-flops where one circuit serves as a master and the other as a slave	Understand	CO 5	CLO 14	AEC008.014
24	Define edge-triggered flip-flop	The term edge triggering means that the flip-flop changes state either at the positive edge or negative edge of the clock pulse and it is sensitive to its inputs	Remember	CO 5	CLO 14	AEC008.014

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		only at this transition of the clock.				
25	Define Classification of the logic family by operation?	The Bipolar logic family is classified into Saturated logic and Unsaturated logic. The RTL, DTL, TTL, I2L, HTL logic comes under the saturated logic family. The Schottky TTL, and ECL logic comes under the unsaturated logic family.	Understand	CO 5	CLO 12	AEC008.012
26	Define Classification of the saturated bipolor logic families?	The bipolar logic family is classified as follows: RTL- Resistor Transistor Logic DTL- Diode Transistor logic I2L- Integrated Injection Logic TTL- Transistor Transistor Logic ECL- Emitter Coupled Logic	Remember	CO 5	CLO 12	AEC008.012
27	Define fan in?	Fan in is the number of inputs connected to the gate without any degradation in thevoltage level.	Remember	CO 5	CLO 15	AEC008.015
28	Define registers.	A register is a group of flip-flops flip-flop can store one bit information. So an n-bit register has a group of n flip-flops and is capable of storing any binary information/number containing n-bits.	Remember	CO 5	CLO 15	AEC008.015
29	Define shift registers.	The binary information in a register can be moved from stage to stage within the register or into or out of the register upon application of clock pulses. This type of bit movement or shifting is essential for certain arithmetic and logic operations used in microprocessors. This gives rise to group of registers called shift registers.	Remember	CO 5	CLO 15	AEC008.015
30	Define the different types of shift registers?	There are five types. They are, Serial In Serial Out Shift Register Serial In Parallel Out Shift Register Parallel In Serial Out Shift Register Parallel In Parallel Out Shift Register Bidirectional Shift Register	Remember	CO 5	CLO 15	AEC008.015
31	Define Asynchronous counters	Asynchronous counter are in which flip-flops are connected in such a way that output of 1st flip-flop drives the clock for the next flipflop.All the flip-flops are Not clocked Simultaneously.	Understand	CO 5	CLO 15	AEC008.015
32	Define synchronous counters	In this type there is no connection between output of first flip-flop and clock input of the next flip - flop All the flip-flops are clocked simultaneously.	Understand	CO 5	CLO 15	AEC008.015
33	Define decade counter.	A decade counter is a binary counter that is designed to count to 1010 (decimal 10)	Understand	CO 5	CLO 15	AEC008.015
34	Define universal shift register.	A universal shift register is an integrated logic circuit that can transfer data in three different modes. Like a parallel register it can load and transmit	Understand	CO 5	CLO 15	AEC008.015

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		data in parallel. Like shift registers it can load and transmit data in serial fashions, through left shifts or right shifts.				
35	Define counter.	A digital circuit which is used for counting pulses is known counter. It is a group of flip-flops with a clock signal applied	Understand	CO 5	CLO 15	AEC008.015
36	Define ring counter.	A ring counter is a type of counter composed of flip-flops connected into a shift register, with the output of the last flip-flop fed to the input of the first, making a "circular" or "ring" structure.	Understand	CO 5	CLO 15	AEC008.015
37	Define johnson counter	A Johnson counter is a modified ring counter, where the inverted output from the last flip flop is connected to the input to the first.	Understand	CO 5	CLO 15	AEC008.015
38	Define excitation table.	Excitation table lists possible inputs for a desired next output state from current output state.	Understand	CO 5	CLO 15	AEC008.015
39	Define logic levels of CMOS.	CMOS gate operating at a power supply voltage of 5 volts, the acceptable input signal voltages range from 0 volts to 1.5 volts for a “low” logic state, and 3.5 volts to 5 volts for a “high” logic state.	Understand	CO 5	CLO 12	AEC008.012
40	Define totem Pole Output.	Totem-pole output, also known as a push-pull output, is a type of electronic circuit and usually realized as a complementary pair of transistors.	Understand	CO 5	CLO 12	AEC008.012

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