Hall Ticket No | | | | | | | | | | | Question Paper Code: AEC008

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-II

B.Tech V Semester End Examinations, November - 2019
Regulation: IARE-R16
INTEGRATED CIRCUITS APPLICATIONS
(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 70**

Answer any ONE question from each Unit
All questions carry equal marks
All parts of the question must be answered in one place only

UNIT – I

1	a)	Derive the expression for Q Point, A, ZI and Z0 of a dual input balanced output differential amplifier.	[7M]
	b)	For a dual input, balanced output differential amplifier, RC = 2.2kΩ, RE = 4.7 kΩ, RS1 = RS2 = 50Ω. The supply voltages are ±10 V. the hfe for the transistor is 50. Assume silicon transistors and hie = 1kΩ. Determine the operating point values, differential mode gain, common mode gain and CMRR.	[7M]
2	a)	What is Input Bias Current and explain how can it be reduced?	[7M]
	b)	An Op - amp has a slew rate of 1.5V/μs. What is the maximum frequency of an output sinusoid of peak value 10 V at which the distortion sets in due to the slew rate limitation?	[7M]

UNIT – II

3	a)	With the help of neat diagrams explain the operation of Schmitt Trigger using IC741.	[7M]
	b)	Design an Op-amp circuit to give an output VO = - (3V1+2V2+0.1V3) for Rf = 10kΩ assume necessary data for R1, R2, R3.	[7M]
4	a)	With the help of neat circuit diagram and waveform explain the operation of Monostable Multivibrator using IC741.	[7M]
	b)	Design a Practical differentiator at 2KHz. Assume necessary data for Rf and Cin.	[7M]

UNIT – III

5	a)	Draw the 1 st order low pass filter using op-amp and derive the expression for higher cut-off frequency	[7M]
	b)	Design a wide band reject filter having fh = 400 Hz and fl = 2kHz having pass band gain as 2. Draw the circuit and corresponding frequency response.	[7M]
6	a)	With the help of circuit diagram and waveform, explain the working of IC 555 Timer as Monostable multivibrator and derive an expression for pulse width.	[7M]
	b)	Design a Notch filter using Op-Amp at 300 Hz.	[7M]

UNIT – IV

7	a)	Explain the types of digital to analog converters with suitable circuit diagrams for Binary Weighted Resistor DAC.	[7M]
	b)	What output voltage would be produced by a D/A converter whose output range is 0 to 10 V and whose input binary number is (i) 10 for a 2-bit D/A Converter (ii) 0110 for a 4-bit D/A Converter (iii) 10111100 for an 8-bit D/A Converter	[7M]
8	a)	With the help of neat circuit diagram and waveform explain the operation of Dual Slope ADC.	[7M]
	b)	Design a dual slope ADC uses a 16 bit counter and a 2 MHz clock rate. The maximum input voltage is +10V. The maximum integrator output voltage should be - 6V when the counter has cycled through 2^n counts. The capacitor used in the integrator is 0.01μf. Find the value of the resistor R of the integrator.	[7M]

UNIT – V

9	a)	What is a carry look ahead adder? Design and implement carry look ahead adder using logical gates.	[7M]
	b)	Design combinational circuit for common anode 7 segment display / driver.	[7M]
10	a)	Design a 4-bit synchronous up-down counter using JK flip-flop.	[7M]
	b)	Implement the parallel input to serial output shift register using 74x163 and 74x166.	[7M]

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COURSE OBJECTIVES
The course should enable the students to:

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.

COURSE OUTCOMES (COs):

CO 1	Discuss the analysis of Op-Amp for different configurations and its properties.
CO 2	Analyze and design the linear and non linear applications of Op-Amp
CO 3	Design the various filters using Op-Amp and analysis of Multivibrators using 555 Timer
CO 4	Describe the various ADC and DAC techniques
CO 5	Explore the concepts of Combinational and sequential logic circuits using digital IC's

COURSE LEARNING OUTCOMES
Students who complete the course will have demonstrated the ability to do the following.

AEC008.01	Illustrate the block diagram, classifications, package types, temperature range, specifications and characteristics of Op-Amp.
AEC008.02	Discuss various types of configurations in differential amplifier with balanced and unbalanced outputs.
AEC008.03	Evaluate DC and AC analysis of dual input balanced output configuration and discuss the properties of differential amplifier and Discuss the operation of cascaded differential amplifier.
AEC008.04	Analyze and design linear applications like inverting amplifier, non-inverting amplifier, instrumentation amplifier and etc. using Op-Amp.
AEC008.05	Analyze and design non linear applications like multiplier, comparator, log and anti log amplifiers, waveform generators and etc, using Op-Amp.
AEC008.06	Discuss various active filter configurations based on frequency response and construct using 741 Op- Amp.
AEC008.07	Design bistable, monostable and astable multivibrators operation by using IC 555 timer and study their applications.
AEC008.08	Determine the lock range and capture range of PLL and use in various applications of communications.
AEC008.09	Understand the classifications, characteristics and need of data converters such as ADC and DAC .
AEC008.10	Analyze the Digital to Analog converter technique such as weighted resistor DAC, R-2R ladder DAC, inverted R-2R ladder DAC and IC 1408 DAC.
AEC008.11	Analyze the Analog to Digital converter technique such as integrating, successive approximation and flash converters.
AEC008.12	Design Adders, multiplexers, demultiplexers, decoders, encoders by using TTL/CMOS integrated circuits and study the TTL and CMOS logic families.
AEC008.13	Design input/output interfacing with transistor – transistor logic or complementary metal oxide semiconductor integrated circuits.

AEC008.14	Understand the operation of SR, JK, T and D flip-flops with their truth tables and characteristic equations. Design TTL/CMOS sequential circuits.
AEC008.15	Design synchronous, asynchronous and decade counter circuits and also design registers like shift registers and universal shift registers.

MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES:

SEE Question No.		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	AEC008.02	Discuss various types of configurations in differential amplifier with balanced and unbalanced outputs.	CO 1	Understand
	b	AEC008.02	Illustrate the block diagram, classifications, package types, temperature range, specifications and characteristics of Op-Amp.	CO 1	Remember
2	a	AEC008.01	Illustrate the block diagram, classifications, package types, temperature range, specifications and characteristics of Op-Amp.	CO 1	Understand
	b	AEC008.01	Illustrate the block diagram, classifications, package types, temperature range, specifications and characteristics of Op-Amp.	CO 1	Remember
3	a	AEC008.05	Analyze and design non linear applications like multiplier, comparator, log and anti log amplifiers, waveform generators and etc, using Op-Amp.	CO 2	Remember
	b	AEC008.04	Analyze and design linear applications like inverting amplifier, non-inverting amplifier, instrumentation amplifier and etc. using Op-Amp.	CO 2	Apply
4	a	AEC008.05	Analyze and design non linear applications like multiplier, comparator, log and anti log amplifiers, waveform generators and etc, using Op-Amp.	CO 2	Remember
	b	AEC008.05	Analyze and design non linear applications like multiplier, comparator, log and anti log amplifiers, waveform generators and etc, using Op-Amp.	CO 2	Apply
5	a	AEC008.06	Discuss various active filter configurations based on frequency response and construct using 741 Op- Amp.	CO 3	Remember
	b	AEC008.06	Discuss various active filter configurations based on frequency response and construct using 741 Op- Amp.	CO 3	Apply
6	a	AEC008.07	Design bistable, monostable and astable multivibrators operation by using IC 555 timer and study their applications.	CO 3	Understand
	b	AEC008.06	Discuss various active filter configurations based on frequency response and construct using 741 Op- Amp.	CO 3	Apply
7	a	AEC008.10	Analyze the Digital to Analog converter technique such as weighted resistor DAC, R-2R ladder DAC, inverted R-2R ladder DAC and IC 1408 DAC.	CO 4	Understand

	b	AEC008.10	Analyze the Digital to Analog converter technique such as weighted resistor DAC, R-2R ladder DAC, inverted R-2R ladder DAC and IC 1408 DAC.	CO 4	Apply
8	a	AEC008.11	Analyze the Analog to Digital converter technique such as integrating,successive approximation and flash converters.	CO 4	Remember
	b	AEC008.11	Analyze the Analog to Digital converter technique such as integrating,successive approximation and flash converters.	CO 4	Apply
9	a	AEC008.12	Design Adders, multiplexers, demultiplexers, decoders, encoders by using TTL/CMOS integrated circuits and study the TTL and CMOS logic families.	CO 5	Understand
	b	AEC008.12	Design Adders, multiplexers, demultiplexers, decoders, encoders by using TTL/CMOS integrated circuits and study the TTL and CMOS logic families.	CO 5	Understand
10	a	AEC008.15	Design synchronous, asynchronous and decade counter circuits and also design registers like shift registers and universal shift registers.	CO 5	Apply
	b	AEC008.15	Design synchronous, asynchronous and decade counter circuits and also design registers like shift registers and universal shift registers.	CO 5	Apply

Signature of Course Coordinator **HOD, ECE**