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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

III B.Tech V Semester End Examinations, November - 2018
Regulation: IARE-R16
INTEGRATED CIRCUITS APPLICATIONS
(Common for ECE/EEE)

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) Explain the use of constant current bias method for Dual input balanced output differential amplifier. [7M]

b) An op-amp with a slew rate = 0.5V/μS is used as an inverting amplifier to obtain a gain of 100. The voltage gain Vs frequency characteristic of the amplifier is flat up to 10 KHz. Determine, [7M]

i. The maximum peak-to-peak input signal that can be applied without any distortion to the output.
ii. The maximum frequency of the input signal to obtain a sine wave output of 2V peak.

2 a) Define and Explain in detail about the operation of Differential amplifier with neat circuit diagram. [7M]

b) For an op-amp PSRR =60 db(min), CMRR= 10^4 and the differential mode gain is 10^5, the voltage changes by 20 V in 4 μ sec. calculate [7M]

i. Numerical value of the PSRR
ii. common mode gain.
iii. Slew rate.

UNIT – II

3 a) What is the instrumentation amplifier? What are the required parameters of an instrumentation amplifier? Explain the working of instrumentation amplifier with neat circuit diagram. [7M]

b) Design a phase shift oscillator for f_o=500 Hz and design a wein bridge oscillator for f_o=1000Hz. [7M]

4 a) What are the limitations of an ordinary op-amp differentiator? Draw and explain the practical differentiator that will eliminate these limitations? [7M]

b) Design a differentiator to differentiate an input signal that varies in frequency from 10 Hz to about 1 KHz. If a sine wave of 1V peak at 1000 Hz is applied to this differentiator draw the output waveforms. [7M]

UNIT – III

5 a) Explain first order high pass filter with neat circuit diagram and also derive its transfer function. [7M]

b) Design a second order Butterworth low-pass filter having upper cut-off frequency 1 kHz. Then determine its frequency response. Given parameters: fh=1 kHz, C=0.1μF, R=1.6KΩ and damping factor α=1.414. [7M]

6 a) Discuss in detail about an Astable multivibrator using 555timer and derive the expression for its frequency of oscillation. [7M]

b) Design a 555 based square wave generator to produce an asymmetrical square wave of 2 KHz. If Vcc=12V, draw the voltage curve across the timing capacitor and output waveform. [7M]

UNIT – IV

7 a) With neat diagram, explain the working principle of R-2R ladder type DAC and list the advantages and disadvantages. [7M]

b) Design a 4 – bit R-2R ladder type D/A convertor and plot the transfer characteristics that is binary input versus output voltage and calculate the resolution and linearity . [7M]

8 a) Explain successive approximation A/D converter with functional diagram for a given analog input. [7M]

b) Design a dual slope ADC uses a 16 bit counter and a 4 MHz clock rate. The maximum input voltage is +10V. The maximum integrator output voltage should be - 8V when the counter has cycled through 2^n counts. The capacitor used in the integrator is 0.1μf. Find the value of the resistor R of the integrator.

UNIT – V

9 a) Explain the following terms with reference to CMOS logic. [7M]

i. Logic Levels
ii. Noise margin
iii. Power supply rails
iv. Propagation delay

b) What is a combinational circuit? Design a combinational circuit for common anode 7 segment display / driver. [7M]

10 a) Define synchronous counter and Design a 3 bit synchronous counter using JK flip flops with truth table. [7M]

b) Implement the truth table of a 4 to 16 decoder using two 74×138 decoders with a neat pin diagram. [7M]

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I. COURSE OBJECTIVES

The course should enable the students to:

S.No	Description
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.

II. COURSE LEARNING OUTCOMES

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

CAEC008.01	Illustrate the block diagram, classifications, package types, temperature range , specifications and characteristics of Op-Amp.
CAEC008.02	Discuss various types of configurations in differential amplifier with balanced and unbalanced outputs.
CAEC008.03	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.
CAEC008.04	Analyze and design linear applications like inverting amplifier, non-inverting amplifier, instrumentation amplifier and etc. using Op-Amp.
CAEC008.05	Analyze and design non linear applications like multiplier, comparator, log and anti log amplifiers, waveform generators and etc, using Op-Amp.
CAEC008.06	Discuss various active filter configurations based on frequency response and construct using 741 Op- Amp.
CAEC008.07	Design bistable, monostable and astable multivibrators operation by using IC 555 timer and study their applications.
CAEC008.08	Determine the lock range and capture range of PLL and use in various applications of communications.
CAEC008.09	Understand the classifications, characteristics and need of data converters such as ADC and DAC .
CAEC008.10	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.
CAEC008.11	Analyze the Analog to Digital converter technique such as integrating, successive approximation and flash converters.
CAEC008.12	Design Adders, multiplexers, demultiplexers, decoders, encoders by using TTL/CMOS integrated circuits and study the TTL and CMOS logic families.
CAEC008.13	Design input/output interfacing with transistor – transistor logic or complementary metal oxide semiconductor integrated circuits.
CAEC008.14	Understand the operation of SR, JK, T and D flip-flops with their truth tables and characteristic equations. Design TTL/CMOS sequential circuits.
CAEC008.15	Design synchronous, asynchronous and decade counter circuits and also design registers like shift registers and universal shift registers.
CAEC008.16	Apply the concept of Integrated circuits to understand and analyze the real time applications.
CAEC008.17	Acquire the knowledge and develop capability to succeed national and international level competitive examinations.

III. MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES:

SEE Question No.		Course Learning Outcomes		Blooms Taxonomy Level
1	a	CAEC008.02	Discuss various types of configurations in differential amplifier with balanced and unbalanced outputs.	Understand
	b	CAEC008.01	Illustrate the block diagram, classifications, package types, temperature range , specifications and characteristics of Op-Amp.	Remember
2	a	CAEC008.01	Illustrate the block diagram, classifications, package types, temperature range , specifications and characteristics of Op-Amp.	Understand
	b	CAEC008.03	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.	Remember
3	a	CAEC008.04	Analyze and design linear applications like inverting amplifier, non-inverting amplifier, instrumentation amplifier and etc. using Op-Amp.	Remember
	b	CAEC008.05	Analyze and design non linear applications like multiplier, comparator, log and anti log amplifiers, waveform generators and etc, using Op-Amp.	Understand
4	a	CAEC008.04	Analyze and design linear applications like inverting amplifier, non-inverting amplifier, instrumentation amplifier and etc. using Op-Amp.	Remember
	b	CAEC008.04	Analyze and design linear applications like inverting amplifier, non-inverting amplifier, instrumentation amplifier and etc. using Op-Amp.	Understand
5	a	CAEC008.06	Discuss various active filter configurations based on frequency response and construct using 741 Op- Amp.	Remember
	b	CAEC008.06	Discuss various active filter configurations based on frequency response and construct using 741 Op- Amp.	Understand
6	a	CAEC008.07	Design bistable, monostable and astable multivibrators operation by using IC 555 timer and study their applications.	Remember
	b	CAEC008.07	Design bistable, monostable and astable multivibrators operation by using IC 555 timer and study their applications.	Understand
7	a	CAEC008.10	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.	Remember
	b	CAEC008.10	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.	Understand
8	a	CAEC008.11	Analyze the Analog to Digital converter technique such as integrating, successive approximation and flash converters.	Remember
	b	CAEC008.11	Analyze the Analog to Digital converter technique such as integrating, successive approximation and flash converters.	Understand
9	a	CAEC008.12	Design Adders, multiplexers, demultiplexers, decoders, encoders by using TTL/CMOS integrated circuits and study the TTL and CMOS logic families.	Remember
	b	CAEC008.12	Design Adders, multiplexers, demultiplexers, decoders, encoders by using TTL/CMOS integrated circuits and study the TTL and CMOS logic families.	Understand
10	a	CAEC008.15	Design synchronous, asynchronous and decade counter circuits and also design registers like shift registers and universal shift registers.	Remember
	b	CAEC008.12	Design Adders, multiplexers, demultiplexers, decoders, encoders by using TTL/CMOS integrated circuits and study the TTL and CMOS logic families.	Understand

Signature of Course Coordinator **HOD, ECE**