## **Question Paper**

Exam Date & Time: 24-May-2023 (02:30 PM - 05:30 PM)



FOURTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, MAY 2023

INTEGRATED CIRCUIT SYSTEMS [BME 2254]

Α

Marks: 50

Duration: 180 mins.

## Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

A voltage follower circuit has a 1V signal and a  $20k_{\Omega}$  load. The source is connected via a  $47k_{\Omega}$  (4)

resistor. Select a suitable value of R1. (Assume  $I_{Bmax} = 500 nA$ )

A)

1)

- i. Calculate Load voltage
- ii. When load is directly connected to source
- iii. When the voltage follower is between load and the source
- iv. Calculate the maximum voltage drop across each resistor R1 and Rs



B)

Design a non-inverting amplifier circuit which is capable of providing a voltage gain of 15. Assume (3) an ideal-opamp and the resistances should not exceed  $30k_{\Omega}$  (Draw the circuit)

C) Find 
$$V_{\alpha}$$
 in the circuit if  $R_f = 10k\Omega$ ,  $R_1 = 2k\Omega$  and  $R_2 = 5k\Omega$  (3)



2)

3)

A)

Design a Differentiator using Opamp for an input signal with  $f_{max}$  =200Hz. Also draw the output (5) waveforms for a sine wave and square wave input of 1V peak at 200Hz sampling frequency (show at least 2 cycles).

B) For a given op-amp PSRR = 70db (min), CMRR =  $10^5$ , differential mode gain  $A_d = 10^5$ . If the (3) output voltage changes by 20 V in 4ms, calculate. (a) PSRR in Numerical Value (b) Common mode gain

(c) Slew Rate

C) For the following inverting Schmitt trigger circuit, calculate the higher and lower trigger points (2)



Using 741 op-amp, design a first order active low pass filter to have a cut-off frequency of 1kHz (4) (Draw the circuit). A)

B) Explain the working of Voltage to current converter (floating load) with a circuit and expressions. (3)

C) Explain the operation of inverting zero cross detector for an input of triangular wave (draw the circuit (3)

and corresponding output waveforms).

- A clinician needs help from a biomedical engineer to measure a clean ECG waves. But the waves (5) contain unnecessary frequency components especially 100 Hz. Suggest and design a solution:
  A)
  - i. Which first order active filter would you choose to denoise?
  - ii. Design the selected filter and explain its frequency response.
  - B) Design a monostable multivibrator using 555 timer to obtain a pulse width of 10ms. (3)
  - C) Explain the terms line regulation and load regulation for a DC voltage regulator with a circuit and (2) expected graphs
- 5) Explain the schematic of the Phase locked loop with the capture transient graph. (4)
  - A)
    B) Determine the output voltage produced by an 8 bit D/A converter whose output range is 0 to 12 v (3) and whose input binary number is:
    - i. 10111101
    - ii. 11001101
    - iii. 11100110
    - C) Explain the role and operation of an op-amp in the conversion of digital input to analog output using (3) a 3-bit DAC circuit

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