Exam Date & Time: 08-Jul-2023 (02:30 PM - 05:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH END SEMESTER MAKEUP EXAMINATIONS, JUNE-JULY 2023 INTEGRATED CIRCUIT SYSTEMS [BME 2254]

Marks: 50

Duration: 180 mins.

(4)

A

Answer all the questions.

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

- 1) A load resistance of $22k\Omega$ is to be connected to a source of 1.5V with source resistance of $56k\Omega$. Calculate the load voltage if
 - A) i. Load is directly connected
 - ii. Load is connected through voltage follower using op-amp with $Z_0 = 75\Omega$, $Z_{in} = 2M\Omega$ and Gain $= 2 \times 10^5$
 - B) Design an inverting amplifier circuit which is capable of providing a voltage gain of 20. Assume an ideal-opamp and the resistances used should not exceed 20kn (Draw the circuit)
 (3)
 - C) Determine the output voltage V_0 for the non-inverting amplifier shown in the figure



2) Explain the working of half wave rectifier and design it to pass only the negative half cycles.

A)

(5)

- B) If the base currents for the emitter coupled transistors of a differential amplifier are $18\mu A$ and $22\mu A$, determine
 - i. Input bias current (3)
 - ii. Input offset current for an op-amp
- C) For the following inverting Schmitt trigger circuit, calculate the higher and lower trigger points



3)		Design a first order active high pass filter for a cut-off frequency of 4.5 kHz (Use 741 $I_B = 1.5 \mu A$	
	A)	Op-amp and assume) (Draw the circuit).	(4)
	B)	Explain the working of Voltage to current converter (Ground load) with a circuit and expressions.	(3)
	C)	Explain the operation of non-inverting voltage level detector for an input of triangular wave (draw the circuit and corresponding output waveforms).	(3)
4)		Using a 741 op-amp with a supply of $\pm 12V$, design an Inverting Schmitt trigger circuit to have trigger points of $\pm 2V$	(4)
	A) B)	A 555 astable multivibrator has $R_A = 2.2k\Omega$ and $R_B = 6.8k\Omega$ and $C = 0.01\mu F$.	(3)

		Calculate	
		i. t _{high}	
		ii. t _{low}	
		iii. Free running frequency	
	C)	Modify a fixed voltage regulator to an adjustable regulator	(3)
5)		Explain the schematic of the Phase locked loop with the low pass filter frequency analysis	(4)
	A)		
	B)	For a given D/A converter, (weighted resistor type) $R_F = 4.7k$ ohms, the resistor in the feedback path of op-amp. The value of free weightage resistor R is 47kohms. Supply voltage $V_{DD} = 5V$. Determine the output voltage V_o if the digital input is 0011	(3)
	C)	Explain the role and operation of an op-amp in the conversion of digital input to analog output using a 2-bit Flash ADC circuit	(3)

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