Reg. No.



III SEMESTER B.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING) MAKE UP EXAMINATIONS, APRIL 2022

SUBJECT: ANALOG SYSTEM DESIGN [ELE 2151]

REVISED CREDIT SYSTEM

Time: 3 Hours	30 April 2022	Max. Marks: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.
- **1A** For the MOSFET Amplifier circuit shown in Fig. Q1 (i) and Q1 (ii), determine the DC operating voltages V_{GS} , V_G , V_D and V_S . Assume $V_{th} = 1 \text{ V}$.



- **1B** Explain the Input and output characteristics of a NMOSFET, mark the different region of operation. Also give the expression for the drain current in terms of MOS parameter
- **1C** Determine R_D to such a way that a drain current of 40 μ A in the MOSFET amplifier shown in Fig Q1C. Assume V_{TH} =0.4 V and $\mu_n C_{ox} \left(\frac{W}{I}\right) = 100 u A/V^2$



(05)

(03)

2A Analyze the small signal model and draw the cascaded MOSFET Amplifier circuit, biased at V_{DD}. Also, determine individual voltage gains (v_0/v_{G3} , v_{G3}/v_{G2} , v_{G2}/v_{G1}) and overall voltage gain v_0/v_{sig} . Given $g_{m1}=g_{m3}=1mA/V$, $g_{m2}=10mA/V$



2B Determine the value of capacitors in order to get $f_L=200$ Hz and $f_H=20$ kHZ of RC coupled amplifier shown in Fig.Q2B. Assume $\lambda=0$



2C Given gm = 2mA/V and RS= 2K Ohm, then find the small signal gain of the amplifier shown in figure



- **3A** A MOS differential pair operated at bias current of I_{DQ} mA and employ a differential gain of 30 V/V and CMRR of 200. Find RD, gm, IDQ and tail current I_{SS} . Assume $V_{Th} = 0.4 \text{ V}$, $R_{SS} = 100 \text{ K}\Omega$ and overdrive voltage=0.5 V. Draw the circuit.
- **3B** Determine the output voltage of an op-amp based amplifier shown in circuit Fig.Q3B

(03)

(02)

(05)

(03)



3C If transconductance of the NMOS is 1 mA/V, Write the small signal circuit of the common gate amplifier and then find the input resistance of the shown in Fig.Q3C



4A The frequency range of different instrument playing a musical track is as shown in the table. Design a suitable first order active filter to listen only electric Guitar sound in the loud speaker. Assume overall passband gain is 24.08 dB. Assume C= 0.01 μF.

Instrument	Frequency
Tabla	60 Hz- 200 Hz
Violin	350Hz- 1.6 KHz
Flute	300 Hz- 1.5 KHz
Electric Guitar	2KHz- 6.2KHz

(05)

(03)

(02)

(02)

- **4B** A 3-stage RC phase shift oscillator is required to produce a sinusoidal oscillation frequency of 6.5 kHz. If 1nF capacitor used in the circuit, calculate the value of frequency determining resistors and the value of the feedback resistor required to get sustained oscillations. Assume $R_1=10$ K Ω . Draw the circuit.
- **4C** If V_1 is 2V then find the value of V_0 in the circuit shown in Fig.Q4C

5A Analyse the schematics of the circuit shown in Fig.Q5A. Draw the signals at points A and B. Determine the signal voltage levels, frequency, and nature of the signals from both output points A and B.
(05)



- **5B** Design and draw 555 timer based circuit to generate a PWM signal of dyty cycle 60% and frequency 1k Hz with voltage range of 0 to 5 V. Assume capacitor available fo the design is 0.01µF.
- **5C** A Schmitt trigger circuit and its characteristics is shown figure Fig.Q5C. Find the values of VLT and VUT



Fig.Q.5C



(03)

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