MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
END SEMESTER PROCTORED ON-LINE EXAMINATIONS

JANUARY 2022

ANALOG SYSTEM DESIGN [ELE 2151]
REVISED CREDIT SYSTEM

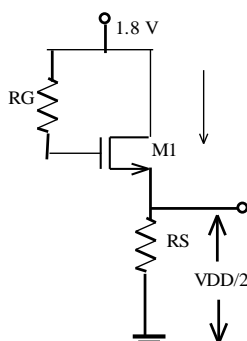**Time: 75 Minutes + 10 Minutes**   **Date: 31 January 2022**   **Max. Marks: 20**

Instructions to Candidates:
- ❖ Answer **ALL** the questions.
- ❖ Missing data may be suitably assumed.
- ❖ Time: 75 minutes for writing + 10 minutes for uploading.

1A. Design the source follower circuit shown in the figure, with a voltage gain of 0.95 and power budget of 4 mW. Assume output DC bias level is equal to VDD/2.

(02)

1B. Design an OPAMP based system which receives signal in the frequency range of 20 Hz to 20 kHz with passband gain of 33.8039 dB and transition roll off is 20 dB/dec. Assume feedback resistor is 10 kΩ and C=0.1uF. Draw the circuit diagram and frequency response of the same.

(05)

1C. A NMOS differential pair operating at a tail current of $2\ \mu A$ and employs an aspect ratio of 50, $\mu_n C_{ox} = 0.6\ mA/V^2$, $R_D = 10\ k\Omega$, $R_{SS} = 100\ k\Omega$, $V_{TH} = 0.4$ V. Find gate to source voltage of input transistors, differential gain and common mode rejection ratio.
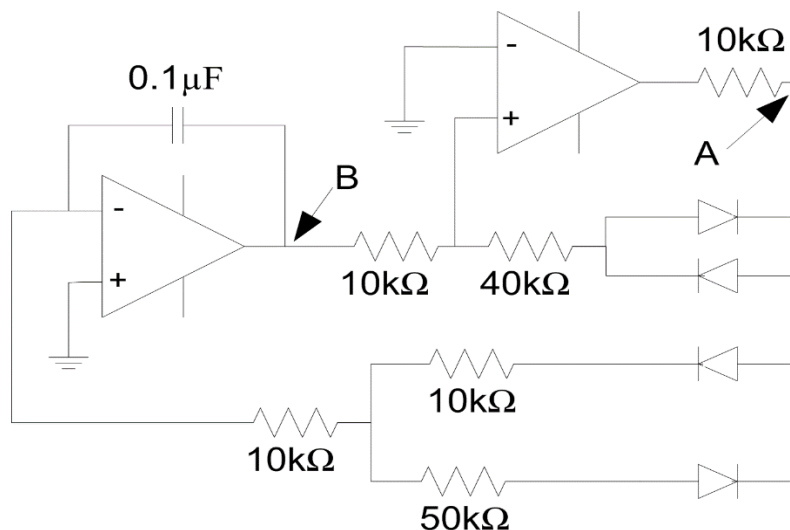
(03)

2A. MOS amplifier with configuration shown in the figure is to be designed for use in a telephone circuit. The magnitude of voltage gain should be 10 V/V in mid-band range, and mid-band frequency should extend from 200 Hz to 20 kHz. Assume $V_{DS} = 5V, V_{GS} = 4V,\ I_D = 2$ mA. & R2=1kΩ

(03)
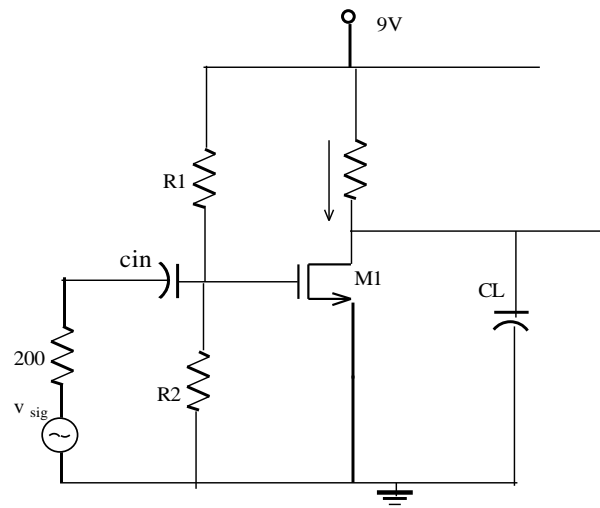
2B. Design and Draw 555 timer-based circuit to generate a square wave of duty cycle 40% and frequency 1kHz, with voltage range of 0 to 5V. Assume the capacitor available for the design in 0.01µF. **(03)**

2C. As part of internship in an Analog system design-based company, the first task upon arrival is to analyze and evaluate the correctness of an already developed circuit by the team. The team claim the circuit can be used for generation of a square wave of range -10V to +10V and a triangular wave of 12V peak-peak, both of frequency 25kHz measured at points A and B respectively. Evaluate and analyze the schematics of the circuit shown below. Draw the signals at points A and B and verify the correctness of the claim with justification. The saturation Voltage levels are taken as ±12V for the design.

(04)