Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

III SEMESTER B. TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
GRADE IMPROVEMENT / MAKEUP EXAMINATIONS, JULY/AUGUST 2021

ANALOG SYSTEM DESIGN [ELE 2151]

REVISED CREDIT SYSTEM

Time: 2 Hours **Date: 02 August 2021** **Max. Marks: 40**

Instructions to Candidates:

- Answer **any four complete questions**.
- Missing data may be suitably assumed/Mention the assumptions

Q1A Draw the small-signal equivalent circuit for the NMOS circuit shown in Fig.Q1A and hence state the topology employed for each of the devices.

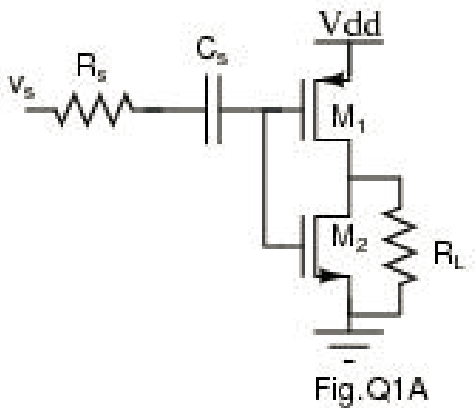

Fig.Q1A

(03)

Q1B For the NMOS amplifier circuit shown in Fig.Q1B. V_{th}=0.5V, $\mu_n C_{ox}$ (W/L) = 2mA/V^2. Determine the value of V_{GS}, V_{DS}, MOSFET small-signal trans-conductance gm and hence determine the small signal gain of the amplifier.

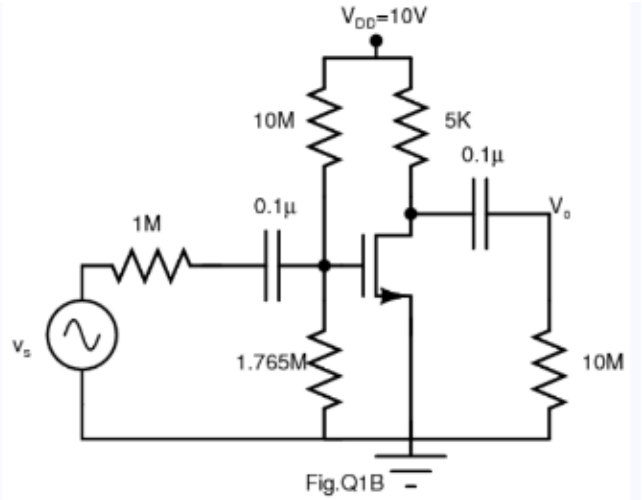

Fig.Q1B

(07)

Q2A Determine the Vgs and drain current I_D, output resistance R_{out} seen from the drain of the MOSFET in the amplifier circuit shown in Fig Q1C. Assume R_D=1KΩ, V_{DD}=1.8V, $\mu_n C_{ox}$=1mA/v^2, (W/L) = 2, Assume MOS output resistance r_0=∞.

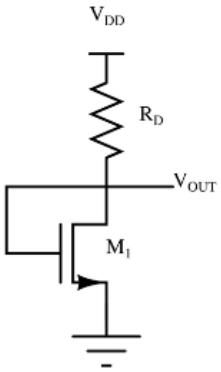

Fig.Q2A

(05)

Q2B The bandwidth of a certain MOSFET amplifier is 100 Hz to 10 KHz. Find the frequency range over which the voltage gain is less than 1 dB from the mid band value. **(05)**

Q3A With a neat circuit diagram explain the working of class B push pull amplifier using complimentary transistor and hence derive efficiency expression **(05)**

Q3B For the op-amp based amplifier circuit shown in Fig.Q3B determine all node voltages and current in each resistor.

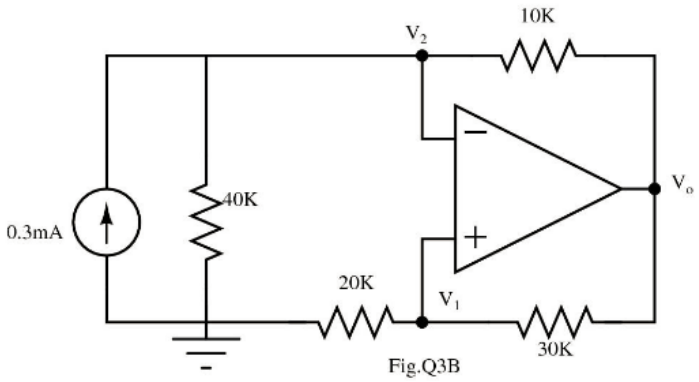

Fig.Q3B

(05)

Q4A With neat circuit schematics, develop the expressions for gain, input and output resistances for an op-amp operating in inverting mode with negative feedback. **(05)**

Q4B Design a practical OPAMP based differentiator to differentiate the analog signals from 10Hz to 5KHz. Assume the feedback resistance is 10KΩ. Draw the circuit schematic and input and output signal waveform if a square wave of 1V peak, 5KHz, is applied as an input signal. **(05)**

Q5A Design an active Butterworth wide band pass filter which can pass signal frequencies from 200Hz to 1KHz with a passband gain of 4 and gain rolls off at a rate of 20dB/decade on both the edges of the pass band. Draw the OPAMP based circuit schematic and gain vs frequency plot of the filter designed. Assume R_f=100KΩ and Vsat=±12 V if required. **(05)**

Q5B Design OPAMP based triangular wave generator of frequency 5KHz, 10V peak to peak using minimum number of components using OPAMP with ±Vsat =12V. Assume the feedback resistance of square wave generator is 240KΩ. **(05)**

Q6A Design a 555-timer based negative edge trigger mono-stable multivibrator circuit to produce a pulse of 3ms. Draw the input trigger signal at pin2, signal at pin6 and output signal at pin3 with respect of time. Assume 50Hz square wave as clock signal, C=0.1uF, V_{DD}=+5V. **(05)**

Q6B With a neat circuit diagram explain the working of full wave precision rectifier. **(05)**