END SEMESTER EXAMINATIONS (JANUARY 2022) - QUESTION PAPER - PART A

COURSE CODE : ICE 2151
COURSE NAME : Analog Electronic Circuits
SEMESTER : III
DATE OF EXAM : 27/01/2022
DURATION : 45 + 3 minutes

Instructions for Students:
(1) ANSWER ALL THE QUESTIONS.
(2) EACH QUESTION CARRIES 1 MARK.
(3) YOU ARE INSTRUCTED TO INFORM THE INVIGILATOR AFTER SUBMISSION OF THIS FORM IN THE CHAT SECTION.

* Required

* This form will record your name, please fill your name.

1

STUDENT NAME: *

2

REGISTRATION NUMBER: *

3

If gate voltage of MOSFET is less than V_{TH} (1 Point)

- $I_D > 0$
- Channel is formed to conduct the current between source and drain
- Channel is depleted of free charge carriers
- All of the above

4

MOSFET operates as variable resistor in the absence of (1 Point)

- Gate voltage
- Drain Voltage
- Channel Pinch-off phenomenon
- Channel length modulation

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The decrease in channel length after pinch off (1 Point)

- Reduces I_D to zero
- Has no effect on I_D
- Causes I_D to increase with V_{DS}
- Causes I_D to decrease with V_{DS}

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The gate oxide layer thickness of MOSFET (1 Point)

- None of the above
- Has no effect on MOSFET characteristics
- Is directly proportional to I_D
- Is inversely proportional to I_D

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The small signal model off the MOSFET is applicable in (1 Point)

- Cut-off region
- Triode region
- Deep triode region
- Saturation region

8

In NMOS, (1 Point)

- Source and Drain are made up of n-type semiconductor
- All of the above
- Channel is made up of holes
- Substrate is made up of n-type semiconductor

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The MOSFETS M1 operates in -------- & --------- regions for the circuits shown in FIG.A & FIG.B. (1 Point)

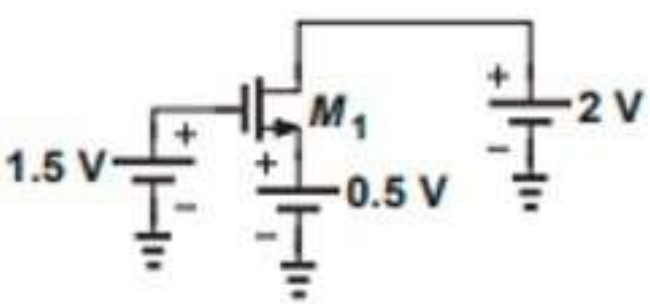
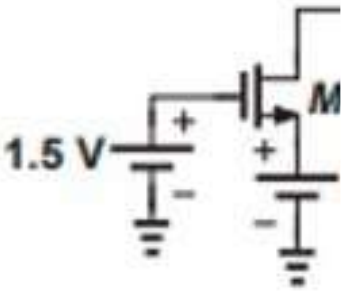


FIG. A



FI

- Linear , Saturation
- Linear , Linear
- Saturation, Saturation
- Saturation , Linear

10

An NMOS device with λ = 0.1 V-1 must provide a $g_m r_o$ of 20 with V_{DS} = 1.5 V. The aspect ratio of the device to get a drain of 0.5 mA is ----------.
(1 Point)

- 1
- 120
- 5
- 8

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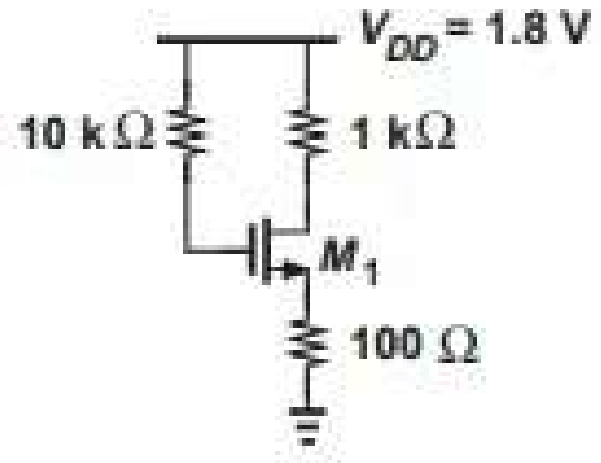
For the circuit shown, the maximum transconductance that M1 can provide (without going into the triode region) is ---------.
(1 Point)



- 50.234ms
- 12.121mS
- 1.276mS
- 0.588mS

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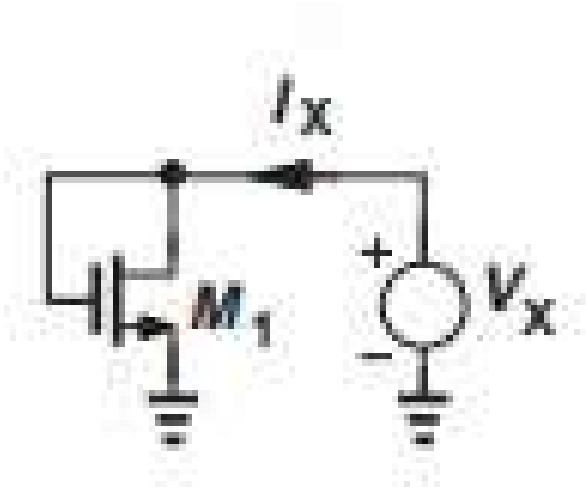
For the circuit shown, I_X variation w.r.t V_X is --------- , for $V_X > V_{TH}$. (1 Point)



- Parabolic
- None of these.
- Exponential
- Linear

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CD amplifier can be used as buffer since it provides (1 Point)

- High Output impedance
- High current gain
- High voltage gain
- Low Input impedance

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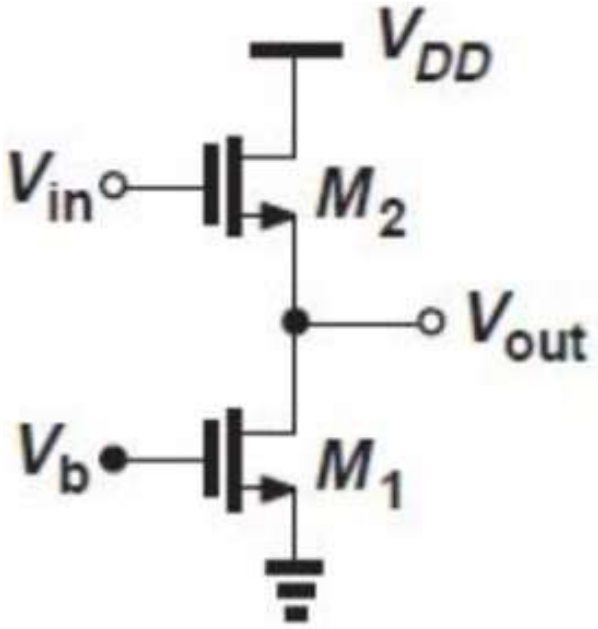
The short-circuit transconductance of the circuit is (1 Point)



- $g_{m1} r_{01}$
- gm1
- gm1 gm2
- gm2

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Negative feedback leads to (1 Point)

- Increase in I/O resistance
- Increase in gain
- All of the above
- Increase in bandwidth

16

Miller effect is seen in (1 Point)

- CS amplifier
- None of the above
- CD amplifier
- CG amplifier

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The differential pair rejects (1 Point)

- supply voltage
- Ripples in supply voltage
- Ripples in input signals
- input signal

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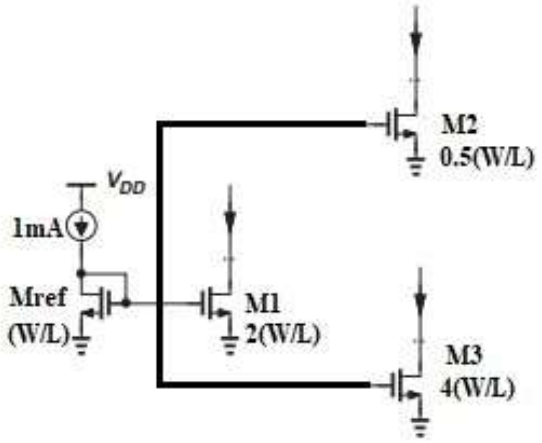

The currents flowing through the MOSFET's are

i. 'M1' is 0.5mA , 'M2' is 2mA

ii. 'M2' is 1mA , 'M3' is 0.25mA

iii. 'M3' is 2mA , 'M1' is 1mA.

Of the three statements (i) is --- (ii) is ---- and (iii) is ----- .

(Assume λ=0 for all the MOSFET's, T = True, F = False)
(1 Point)

- ◯ T F F
- ◯ F F F

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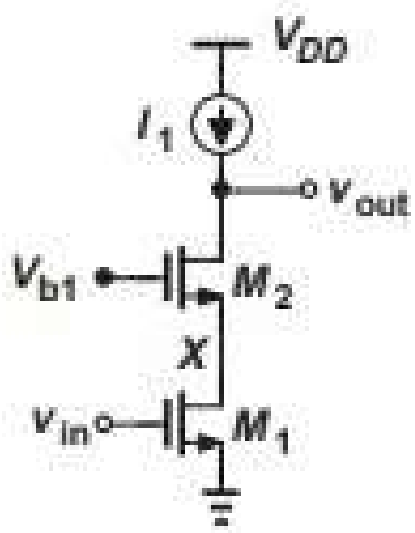
The circuit shown is designed to get a voltage gain of 10. To rise the voltage gain by twofold, following adjustments in the parameters are made



i. ID value is doubled without changing the aspect ratios of 'M1' & 'M2'.

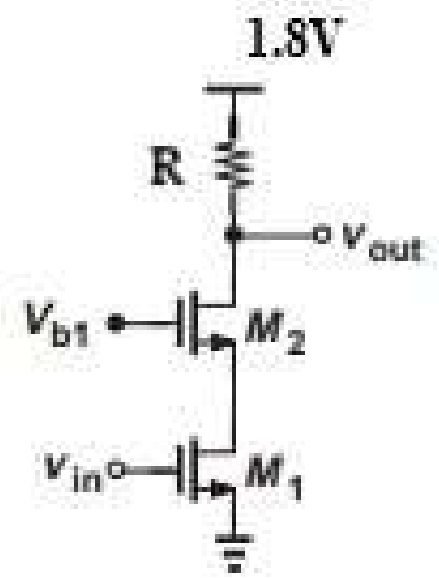
ii. gm1 & ro1 values are doubled, ro2 is reduced by 0.5 keeping gm2 constant.

iii. gm2 & ro2 values are doubled, ro1 is reduced by 0.5 keeping gm1 constant.
Of the three statements (i) is --- (ii) is ---- and (iii) is -----.
T = True, F = False.
(1 Point)

- T T F
- T T T

20

For the circuit shown below, following statements are made assuming 'M1' and 'M2' as identical MOSFET'S with over drive voltage 0.2V , ro = 1.5KΩ & drain current 1mA.



i. If the value of 'R' is 1.5KΩ, voltage gain Av = 56.25.

ii. If the value of 'R' is 1.8KΩ, Output resistance ROUT = 1.406KΩ.

Of the two statements (i) is --- and (ii) is ----.
T = True & F = False. (1 Point)

- T F
- F F
- T T
- F T

21

In current mirrors, if gate-source voltage of two identical MOS transistors are equal, then the channel currents should be _____ (1 Point)

- Equal
- Different
- Both a and b
- None of the above

22

Identify an oscillator from the below list which doesn't belong to low frequency oscillation? (1 Point)

- RC phase shift oscillator
- Twin T oscillators
- Wien bridge oscillator
- Crystal oscillator

23

Hartley oscillator consists of_____ capacitors in its Tank circuit. (1 Point)

- Three
- Two
- Four
- One

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The input impedance_____ when current (Negative) feedback is applied to an amplifier. (1 Point)

- None of the above
- remain constant
- increases
- decreases

25

Identify the wrong statement from the below list with reference to negative feedback amplifiers (1 Point)

- Improves gain stability
- Widens the separation between 3db frequency
- Increases gain – bandwidth product
- Reduces distortion

26

Class AB power amplifier is commonly used in order_____ (1 Point)

- To overcome cross-over distortion
- To get maximum efficiency
- To remove even harmonics
- To reduce collector dissipation

27

Compute the minimum power rating required for a transistor in Class A amplifier (With single transistor) if amplifier delivers 50W to a transformed coupled load? Assume transformer is ideal. (1 Point)

- 100W
- 50W
- 75W
- 25W

28

Select the right answer for Rin and Rout (λ>0) in Common Source topology of MOSFET (with Rs and RD) (1 Point)

- ∞ and RD * [(1+gmro) Rs + ro]
- ∞ and [(1+gmro) Rs + ro]
- ∞ and RD + [(1+gmro) Rs + ro]
- ∞ and RD || [(1+gmro) Rs + ro]

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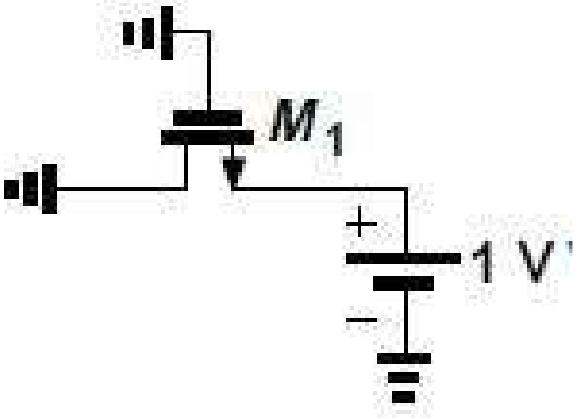
A microphone with zero dc level drives a CS stage biased at I_D=0.5 mA. If W/L = 50, µnCox =100 µA/V2, V_{TH} =0.5 V, and V_{DD}=1.8V, determine R_{Dmax} and A_{vmax}. Neglect channel length modulation. (1 Point)

- R_D < 2.71 & Av< 6.1
- R_D < 1.71 & Av < 6.1
- R_D < 0.71 & Av < 3.1
- R_D < 3.71 & Av < 5.1

30

Find the region of operation of M1? (1 Point)



- On
- Saturation
- Off
- Triode

31

The frequency of oscillation in LC Oscillator is _____ Inductor and Capacitor (1 Point)

- Independent of the values of
- Proportional to square of
- Inversely proportional to square root of
- Directly proportional to

32

The commonly observed application of Hartley Oscillator is in____ (1 Point)

- Radio receivers
- None of the above
- TV receivers
- Radio transmitters