MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

THIRD SEMESTER B. TECH. (Electronics and Instrumentation Engg.)

GRADE IMPROVEMENT EXAMINATION JULY - 2021

SUBJECT: ANALOG ELECTRONIC CIRCUITS [ICE 2151]

TIME: 2 HOURS	28-07-2021	MAX. MARKS: 40
	Instructions to candidates	
	• Answer ANY FOUR FULL questions.	
	• Missing data may be suitably assumed.	

- Sketch the basic construction of NMOS transistor and explain its operations in different 5 regions. Also explain channel pinch-off and channel length modulation with suitable diagrams.
- **1B.** With the help of equivalent circuits, derive the expression for input and output impedance of a common gate FET amplifier. Calculate the small signal voltage gain of the network shown in Fig Q1B, if V_{DD} = 1.8V, I_D =1mA, μ nCox = 100 μ A / V², V_{TH} =0.5V and λ = 0. Verify that M1 operates in saturation region.



Fig. Q1B

- **2A.** Derive the expression for voltage gain of a differential pair with active load using small signal **5** analysis.
- **2B.** Explain the concept of cascode current source in FET amplifier. The MOS cascode circuit **5** shown in Fig. Q 2B must provide a bias current of 0.5 mA with an output impedance of at least 50 k Ω . If μ nCox = 100 μ A / V², and W / L= 20/0.18 for both transistors, compute the maximum tolerable value of λ .



3A. State and explain Common Mode Rejection Ratio (CMRR) in MOS differential pairs. 5 Compute the differential voltage gain of the circuit shown in Fig Q3A. Assume symmetry and λ is greater than zero.



Fig. Q3A

- **3B.** List out the steps involved in analysing the frequency response of an FET amplifier. Explain **5** the concept of 'Miller effect' by taking a simple source follower circuit as an example.
- 4A. Using Miller's approximation, find the pole frequency of a common source amplifier (with R_G 5 and R_D) and draw it's frequency response using Bode's rule.
- **4B.** In the circuit shown in Fig Q4B, a parasitic resistance R_p has appeared in series with the **5** source. Determine the input and output poles of the circuit by neglecting other capacitances. Assume $\lambda = 0$.





- **5A.** With a circuit, explain the characteristics of a voltage series and voltage shunt feedback **5** amplifier. Determine the expressions for gain, input and output impedance.
- **5B.** Draw the circuit diagram for Colpitt's oscillator. Obtain the value of inductor, if $C_1 = 0.25 \mu F$, **5** $C_2 = 0.025 \mu F$ and frequency of the oscillator is 10kHz. Also explain the construction and working of RC phase shift oscillator.
- 6A. Illustrate the properties and effect of AC load line on Class A, Class B and Class AB type of 5 power amplifiers.
- **6B.** What is crossover distortion? In which type of amplifiers such effects are seen? Explain it **5** with neat sketches.
