

(3 Hours)

[Total Marks: 80]

- N.B.: (1) Question No. 1 is compulsory.
 (2) Solve any **three questions** from the **remaining five**
 (3) Figures to the right indicate full marks
 (4) Assume suitable data if necessary and mention the same in answer sheet.

Q.1 Attempt any 5 questions

[20]

- What is the major limitation of class B power amplifier and how to overcome the same?
- Compare series and shunt voltage regulators.
- Draw high frequency hybrid pi equivalent circuit of FET and define various components in the model.
- Draw the circuit diagram of Widlar current source and derive the relationship between output current and reference current.
- Compare ideal and practical OP-AMP.
- Define differential and common mode gain and differential and common mode input impedance of the differential amplifier.

Q.2

- Determine the corner frequency and maximum gain of MOSFET amplifier. For the circuit shown in fig 2a) the parameters are $R_S=3.2K\Omega$, $R_D=10K\Omega$, $R_L=20K\Omega$ and $C_L=10pF$. The transistor parameters are $V_{TP}=-2V$, $K_p=0.25mA/V^2$ and $\lambda=0$. Consider $I_{DQ}=0.5mA$ and $V_{SGQ}=3.41V$

[10]

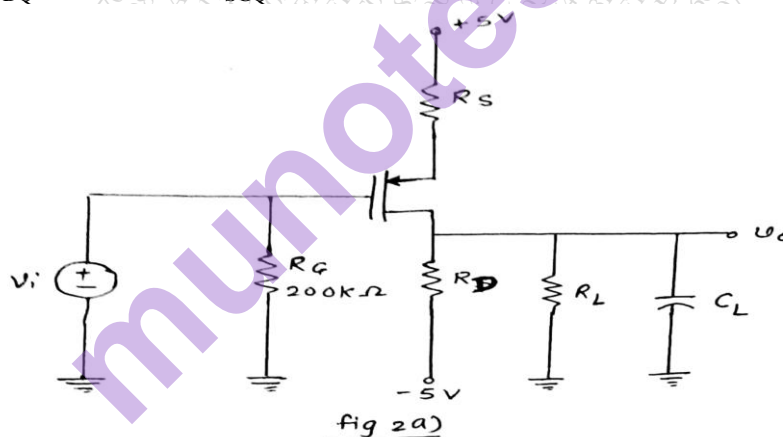


Fig.2a

- Determine unity gain bandwidth of N channel MOSFET with parameters $K_n=0.25mA/V^2$, $V_{TN}=1V$, $\lambda=0$, $C_{gd}=0.04pF$ and $C_{gs}=0.2pF$. Assume the transistor is biased at $V_{GS}=3V$. Calculate Miller capacitance and 3dB frequency of the circuit when $10K\Omega$ load is connected to the output.

[10]

Q.3

- Draw circuit diagram of two stage common emitter amplifier (CE-CE) and derive overall voltage gain, current gain, input resistance and output resistance using hybrid pi equivalent circuit.
- Draw the circuit diagram of MOSFET based differential amplifier and derive expression for differential voltage gain, common mode gain and CMRR.

[10]

- Q.4 a) Draw the circuits of OpAmp based integrator circuit and derive the expression for output voltage. What are the limitations of integrator circuit and how to overcome the limitations? [10]
- b) Draw the circuit diagram of Darlington pair amplifier using BJT and derive the expression for A_v , A_i , Z_i and Z_o [10]
- Q.5 a) Draw and explain the working of class B power amplifier. Explain its working with the help of waveforms and derive expression for power conversion efficiency. [10]
- b) Draw circuit diagram of Adder using OP-AMP and derive expression for its output voltage. [10]
- Q.6 Short notes on: (Attempt any four) [20]
- Wilson Current sources
 - Power MOSFET
 - Cascode Amplifier
 - Differentiator using Op-AMP
 - Class C power Amplifier
