

(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]

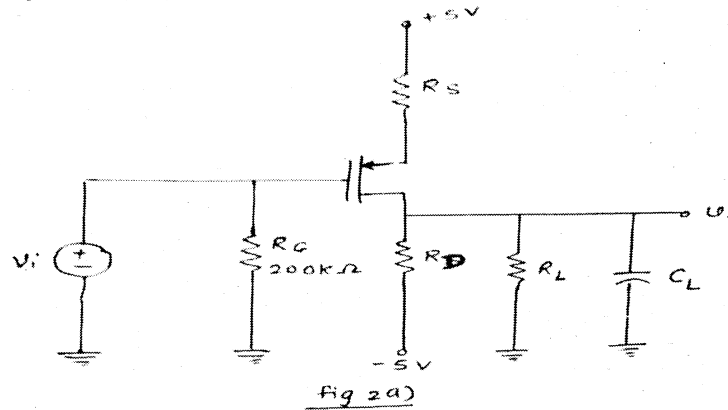


Fig.2a

- 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.
- 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]

[10]

[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]
- a) Wilson Current sources
  - b) Power MOSFET
  - c) Cascode Amplifier
  - d) Differentiator using Op-AMP
  - e) Class C power Amplifier

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