



Max. Marks:80

Duration: 3hrs

NB:

- (1) Question No.1 is compulsory.
- (2) Answer any **three** from remaining questions.
- (3) **Figures** to the right indicate full marks.
- (4) Assume suitable data if required.

Q.1 Attempt any four

- a Give the equation for the current in semiconductor diode. With the help of this equation explain in detail the V-I characteristics of a semiconductor diode. 5
- b Explain effect of temperature on JFET and derive equation for zero temperature drift. 5
- c For the circuit shown in fig 1 determine small signal hybrid pi parameters of transistor. 5

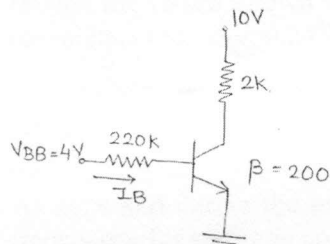


Fig.1

- d Design clipper circuit for the output shown in figure.2 Assume diode is ideal.

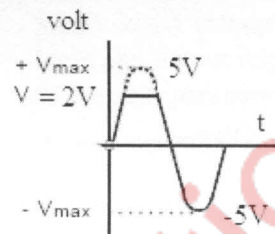


Fig.2

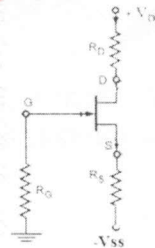


Fig.3

- e For the FET shown in figure.3 the drain current equation is $I_{DQ} = 9 \left(1 + \frac{V_{GSQ}}{3} \right)^2$ mA. 5
 Determine I_{DQ} , V_{GSQ} , V_{DSQ} , V_D . $V_{DD}=18V$, $R_D=2.2k\Omega$, $R_S=1.2K\Omega$, $-V_{SS}=-9V$ and $R_G=1M\Omega$.

Q.2

- a For the circuit shown in Fig.4 determine the V_{ECQ} , I_{CQ} , V_C , and V_E .

10

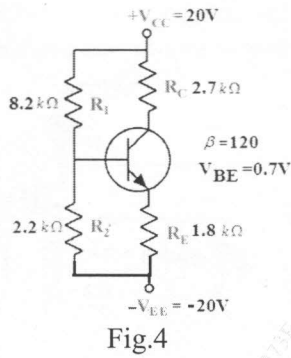


Fig.4

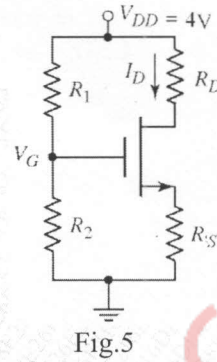


Fig.5

- b Design the circuit shown in Fig.5 such that $V_{GS}=0.50V$ and $V_{DS}=2.5V$. The transistor parameters are: $V_{TN}=0.24V$, $K_n=1.1mA/V^2$, and $\lambda=0$. Let $R_1+R_2=50K\Omega$.

10

Q.3

- a Analyze and derive the expression for the voltage gain, input impedance and output impedance for common collector amplifier with voltage divider biasing.

10

- b For the amplifier shown in Fig.6 analyze and determine.

10

- i. Small-signal voltage gain.
- ii. Input and output impedance.

BJT and circuit parameters are: $\beta = 100$, $V_{BE} = 0.7V$. $R_1 = 56k\Omega$, $R_2 = 12.2k\Omega$, $R_E = 0.4k\Omega$, $R_C = 2k\Omega$, $R_L = 10k\Omega$, $R_S = 0.5k\Omega$, $V_{CC} = 10V$

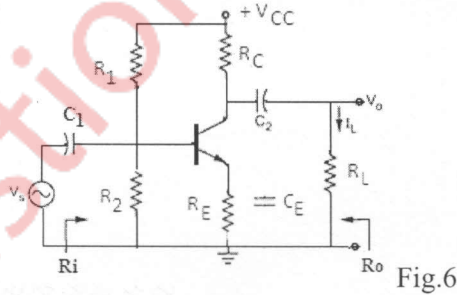


Fig.6

Q.4

- a Draw the structure of an N-channel Enhancement type MOSFET. Explain its working with the help of output drain characteristics and transfer characteristics. 10
- b For the MOSFET common source amplifier shown in fig.7 determine output voltage, input impedance and output impedance. Given: $V_{TN} = 1V$, $K_N = 0.5 \text{ mA/V}^2$, $\lambda = 0.01 \text{ V}^{-1}$. 10

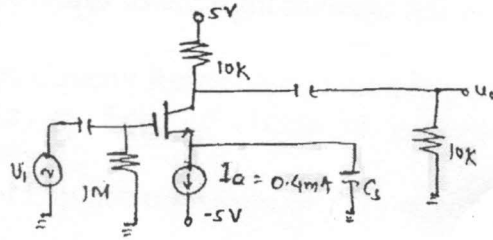


Fig.7

Q.5

- a Draw and explain energy band diagram of MOS capacitor in accumulation, depletion and inversion region. 10
- b Derive the expression for frequency of oscillation for a transistorized (BJT) RC phase shift oscillator. 10

Q.6

Write a short note on following.

- a Cristal oscillator and its application. 5
- b Schottky Diode (Construction and operation and application) 5
- c Graphical analysis of BJT amplifier to determine parameters. 5
- d h-Parameter equivalent circuit for BJT 5
