

Q.P. Code : 545202

(3 Hours)

Total Marks : 80

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.

Q1. Attempt any four.

- a Explain the effect of temperature on VI characteristics of a PN junction diode. 05
- b What are the important parameters of a JFET? How these parameters are determined graphically? 05
- c What is Early effect? Explain how it affects the BJT characteristics in CB configuration. 05
- d For the circuit shown in figure.1 draw the output waveform. Assume diode is ideal. 05

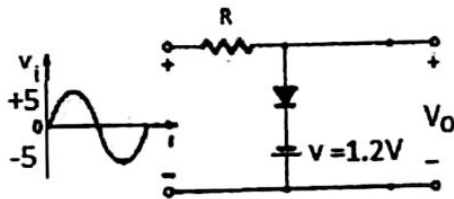


Fig.1

- e For the FET shown in figure.2 the drain current equation is 05

$$I_{DQ} = 9 \left(1 + \frac{V_{GSQ}}{3} \right)^2 \text{ mA, Determine } I_{DQ}, V_{GSQ}, V_{DSQ}, V_D$$

$$V_{DD} = 20V, R_D = 2k\Omega, R_S = 1.5k\Omega, -V_{SS} = -10V.$$

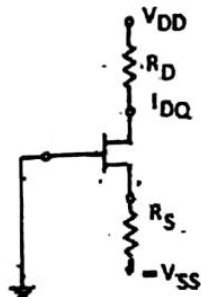


Fig.2

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TURN OVER

- Q2. a Describe the construction and operation of an N-channel MOSFET in enhancement mode. Draw its characteristics and equivalent circuit of the device. 10
- b Describe the different MOSFET biasing techniques. Determine the drain current, drain to source voltage, and Power dissipated in the transistor of CS circuit with an N-channel E MOSFET shown in figure 3. $R_1 = 30k\Omega$, $R_2 = 20k\Omega$, $R_D = 20k\Omega$, $R_S = 0.5k\Omega$, $V_{DD} = 5V$, $V_{TN} = 1V$, $k_N = 0.1mA/V^2$ 10

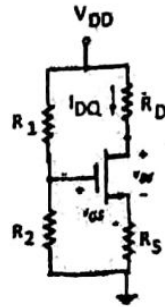


Fig.3

- Q3. a Draw input and output characteristics of CE amplifier. Explain graphical analysis to determine parameters. (Z_i , Z_o , A_V , and A_i) 10
- b In the Common Emitter configuration with voltage divider bias $I_B = 1mA$ 10
 $V_{CE} = 2V$, $R_E = 1k\Omega$ and $\beta = 49$. Determine the values of R_C , R_1 and R_2 such that the stability factor does not exceed 5. Assume $V_{CC} = 5V$ and $V_{BE} = 0.3V$.
- Q4. a For the amplifier shown in figure.4 analyze and determine 10
- Small-signal hybrid pi parameters of BJT
 - Small-signal voltage gain
 - Input and output impedance.
- The circuit parameters are: $R_1 = 56k\Omega$, $R_2 = 12.2k\Omega$, $R_E = 0.4k\Omega$, $R_C = 2k\Omega$, $R_L = 10k\Omega$, $V_{CC} = 10V$ and BJT parameters are $\beta = 100$, $V_{BE} = 0.7V$

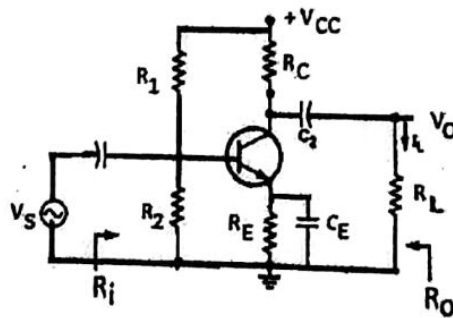


Fig.4

TURN OVER

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b Draw JFET CS amplifier with voltage divider bias and derive the expressions for the voltage gain, input impedance and output impedance. 10

Q5 a For the amplifier shown in figure.5 derive the expression for voltage gain, input and output impedance. The parameters of the MOSFET in the circuit shown in fig .5 are ; $R_G = 1M\Omega$, $V_{DD} = 5V$, $-V_{SS} = -5V$, $V_{TN} = 0.8V$, $k_N = 0.85 \text{ mA/V}^2$ 10

(i) Determine the values of R_S and R_D such that $I_{DQ} = 0.1\text{mA}$ and maximum symmetrical 1V peak sinusoidal signal occurs at output. (ii) Find the small signal transistor parameters. (iv) Determine the small-signal voltage gain A_v

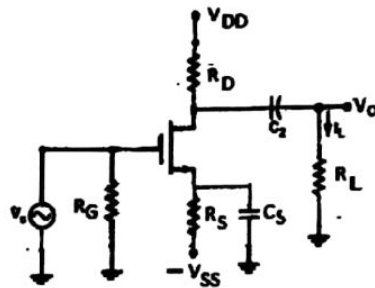


Fig.5

b Draw the circuit diagram of Wein Bridge Oscillator and derive the expression for the frequency of oscillation and minimum gain required for sustained oscillation 10

Q6 Write a short note on following 20

- a Twin-T Oscillator.
- b Varactor Diode (Construction and operation)
- c D C load line concept in BJT. Why Q point should be at the middle of DC load line and fixed?
- d MOS capacitor
