Q2 (a) Describe the four methods available for fabricating Integrated Resistors and explain Thin Film Resistor with a neat sketch.

Answer Refer to page numbers 22 & 25 from text book II

Q2 (b) Explain Complementary MOSFET fabrication process with neat sketch.

Answer Refer to page numbers 30 from text book II

Q3 (a) Draw the h-parameter equivalent circuit of Common Emitter Amplifier circuit and derive the expression for input impedance, output impedance, voltage gain and current gain.

Answer Refer to page numbers 254 & 258 from text book I

Q3 (b) Compare CE, CB and CC. Discuss typical application of each.

Answer

(b) **Solution to the Numerical:**

Given data: $I_B = 20\,\mu A$ and $I_C = 1$ mA

The AC resistance for transistor BE junction, $r_e' = \frac{26mV}{I_E} \approx \frac{26mV}{1mA} = 26\Omega$

The current gain, $\beta = h_{fe} \approx \frac{I_C}{I_B} \approx \frac{1mA}{20\mu A} = 50.$

The input resistance, $r_\pi = h_{ie} = (1 + h_{fe}) r_e' = (1+50) X 26\Omega$

$\approx 1.33K\Omega$

Q4 (a) Sketch a typical drain characteristic for V_{GS} = 0 for an N-channel JFET. Explain the shape of the characteristic and identify the regions.

Answer Refer to page numbers 350 & 351 from text book I

Q4 (b) An N-channel JFET has drain-source saturation current (I_{DSS}) = 8.7 mA, pinch-off voltage (V_P) = - 3V and gate-source voltage (V_{GS}) = -1 V. Determine:

(i) Drain current (I_D)

(ii) Transconductance for V_{GS} = 0 (g_{mo})

(iii) Transconductance (g_m)

Answer

(b) **Solution to the Numerical:**

Given data: Drain-source saturation current, $I_{DSS} = 8.7mA = 0.0087A$

Pinch-off voltage, V_P = -3 V

Gate-source voltage, V_{GS} = -1 V

(i) Drain current, $I_D = IDSS\left(1 - \frac{V_{GS}}{V_P}\right)^2 = 0.0087\left(1 - \frac{-1}{-3}\right)^2$

$$I_D = 3.8667mA$$

(ii) Transconductance for $V_{GS} = 0$,

$$g_{mo} = \frac{-2I_{DSS}}{V_P} = \frac{-2X8.7mA}{-3} = 5.8mA/Vor5.8mS$$

(iii) Transconuctance,

$$g_m = g_{mo}\left(1 - \frac{V_{GS}}{V_P}\right) = 5.8\left(1 - \frac{-1}{-3}\right) = 3.867mA/Vor3.867mS$$

Q5 (a) Explain with a diagram, the working of a transformer coupled class AB power amplifier.

Answer Refer to page numbers 818 & 819 from text book I

Q5 (b) What is an Opto-coupler? Explain its construction and operation with neat diagrams.

Answer Refer to page numbers 971 & 972 from text book I

Q6 (a) Draw the block diagram of Op-Amp internal circuit and explain the function of each block briefly.

Answer Refer to page numbers 53 from text book II

Q6 (b) Derive an expression for the voltage gain of Non-Inverting Op-Amp.

Answer Refer to page numbers 47& 48 from text book II

Q6 (c) What are the various DC characteristics of Op-Amp? Explain Input Offset Voltage.

Answer Refer to page numbers 104,108 & 109 from text book II

Q7 (a) Draw the circuit diagram of Sample and Hold circuit using op-amp and explain its operation with the help of input and output waveforms.

Answer Refer to page numbers 153 & 154 from text book II

Q7 (b) Explain the working of integrator using Op-Amp

Answer Refer to page numbers 168 & 169 from text book II

Q8 (a) Draw the circuit diagram of triangular waveform generator using op-amp and describe its operation with waveforms.

Answer Refer to page numbers 220 & 222 from text book II

Q8 (b) Draw the circuit of monostable multivibrator using 555 timer and explain its operation.

Answer Refer to page numbers 312 & 314 from text book II

Q9 (a) Draw the functional block diagram of 723 general purpose voltage regulator IC and explain its operation.

Answer Refer to page numbers 248 &250 from text book II

Q9 (b) Draw the block diagram of Counter Type A/D Converter and explain its operation with the help of waveform

Answer Refer to page numbers 360 & 361 from text book II

Text Book

Text book I: Electronic Devices and Circuits by David A. Bell 4th Edition, Ph (2006).

Text book II: Linear Integrated Circuits by D .Roy Choudhry and Shail B. Jain , New Age International Publishers, revised 2 nd Edition .