2074
B.E. (Electrical and Electronics Engineering)
Third Semester
PC-EE-303: Analog Electronics

Time allowed: 3 Hours   Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.

x-x-x

I.
 a) What is the difference between Avalanche breakdown and Zener breakdown ?
 b) Find output resistance of BJT for early voltage of 100 V and collector current of 1mA.
 c) Draw I_D-V_{DS} characteristics of MOSFET.
 d) Define slew rate. How it affects Op-Amp performance?
 e) Which type of feedback is applied to the oscillators?

$[5 \times 2 = 10]$

SECTION A

II.   a) Give small signal model of diode and derive expression for its dynamic resistance.   [5]
   b) A silicon diode has a reverse saturation current of 0.20 pA at 30°C. Find the diode current when it is forward biased by 0.65V at a temperature of 100°C.
   [5]

III.   a) Consider a common emitter circuit using a BJT having $I_S = 10^{-15}$A, a collector resistance $R_C = 6.8$ kΩ and a power supply = 10V. Determine the value of bias voltage V_{BE} required to operate the transistor at $V_{CE} = 3.2$V. What is the corresponding value of collector current I_C?   [5]
   b) With the help of suitable diagrams, explain how BJT is used as an amplifier and as a switch. Draw transfer characteristics for CE configuration.
   [5]

IV.   a) Draw device structure and explain physical operation of MOSFET in enhancement mode with and without gate voltage.
   [5]
   b) For a MOSFET with W/L= 8μm/0.8μm, calculate values of V_{GS} and V_{DSmin} needed to operate it in the saturation region with a dc current $I_D = 100$ μA.
   [5]

SECTION B

V.   a) Draw and explain equivalent circuit of an opamp. Plot its ideal voltage transfer curve.   [4]
   b) Define the terms: CMRR, Output offset voltage and Gain bandwidth product.   [6]

VI.   a) With the help of suitable diagram, explain functioning of integrator and derive expression for its output voltage. Plot frequency response of basic and practical integrator?   [5]
   b) Design a Phase Shift oscillator using op-amp for output frequency of 1 kHz.   [5]

VII. Write note on following:
   a) Instrumentation Amplifier
   b) Peak detector   [5]
                                                         [5]

x-x-x