

B.E. (Electronics and Communication Engineering)
Third Semester
EC-307: Electronics Devices and Circuits

Time allowed: 3 Hours

Max. Marks: 50

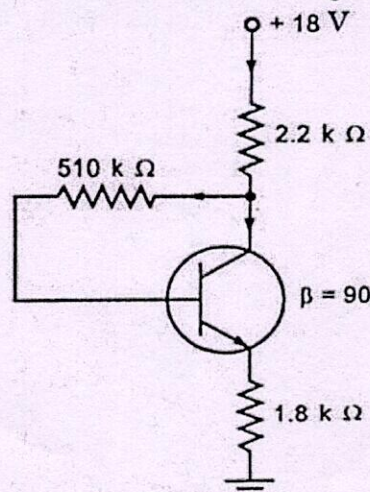
NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of scientific calculator is allowed.

x-x-x

- I. (a) Why does FET act as an excellent buffer amplifier? (1)
(b) Explain whether transistor action be achieved by connecting two diodes back-to-back. (1)
(c) Why silicon transistors are preferred over germanium type? (1)
(d) What is a tuned amplifier? (1)
(e) Why a power amplifier is always preceded by a voltage amplifier? (1)
(f) Why the overall gain of a multistage amplifier is always less than the product of gains of individual stages? (1)
(g) Why is crystal oscillator used in communication transmitters and receivers? (1)
(h) Which coupling scheme is best for multistage amplifiers to amplify very low-frequency signals. (1)
(i) How is bandwidth related to resonant frequency and quality factor in a tuned amplifier? (1)
(j) Between a voltage amplifier and a power amplifier, which one usually exhibits higher distortion and why? (1)

Part- A

- II. (a) Define α and β of a transistor and derive relationship between them. (2)
(b) Find the operating point for the circuit shown in the figure. Assume silicon transistor. (3)



- (c) Compare the CB, CE and CC configurations of a transistor. Which configuration is best for amplification and why? For CE configuration, prove that $I_C = \beta I_B + (\beta + 1)I_{CO}$. (5)

(2)

- III. (a) Explain how transistor acts as an amplifier. (2.5)
 (b) Why are hybrid parameters preferred for the analysis of circuits using bipolar transistors? List their merits and demerits. (2.5)
 (c) Explain working of a JFET. Define parameters of JFET and develop its equivalent circuit. (5)
- IV. (a) Explain the major difference/s between the construction of an enhancement-type MOSFET and depletion-type MOSFET. (2)
 (b) An N-channel JFET has $I_{DSS} = 8.4 \text{ mA}$ and $V_P = -3 \text{ V}$. What is the value of drain current and transconductance for $V_{GS} = -1.5 \text{ V}$? (3)
 (c) Derive the expressions of input impedance, output impedance, voltage gain and current gain in terms of hybrid parameter for a CE amplifier with potential divider bias. (5)

Part-B

- V. (a) Draw an R-C coupled amplifier with two stages. Explain its frequency response and define bandwidth. (5)
 (b) Draw and explain the circuit diagram of a complementary symmetry push-pull amplifier. Describe its advantages and disadvantages. (5)
- VI. (a) Can the gain of an RC-coupled amplifier be improved at low frequencies? Explain. (2)
 (b) Can a voltage amplifier work as a good power amplifier? If not, what modifications are needed? (3)
 (c) Explain how oscillations are initiated and later sustained in an oscillator. Draw the circuit diagram of a R-C phase shift oscillator and explain its principal of operation. (5)
- VII. (a) A tuned collector oscillator makes use of an L-C tuned circuit with $L = 29.3 \mu\text{H}$ and $C = 450 \text{ pF}$. Find the frequency of oscillation. (2)
 (b) Explain how maximum transfer of power from source to load is ensured in power amplifiers. (3)
 (c) What is a cascode amplifier? Explain its working and basic characteristics. (5)