

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. 1 which is compulsory and selecting two questions from each Section. Use of scientific calculator is allowed.

x-x-x

1. Answer the following: -

- (a) What do you mean by thermal-runaway in a transistor? (1)
- (b) What are the applications of CB configuration? (1)
- (c) Sketch small signal model of FET at low frequencies. (1)
- (d) In which region n-channel E-MOSFET will operate, if $V_{GS} = 5V$, $V_{T0} = 1V$ and $V_{DS} = 4V$? (1)
- (e) When a perfect square pulse is applied to the transistor base, the transistor does not switch on immediately. Why? (1)
- (f) What happens if collector and emitter regions of BJT are equally doped with same area? (1)
- (g) Define Q-factor in tuned amplifiers. (1)
- (h) What is the frequency of oscillation of a Wein bridge oscillator? (1)
- (i) Why the transistor circuit require stabilization? (1)
- (j) Why the operating point of a transistor is kept fixed at the centre of the active region? (1)

SECTION A

- 2. (a) Define stability factor. Explain with circuit diagram of potential divider method of biasing in transistors. (5)
- (b) Explain the input and output characteristics of a transistor in CB configuration. (5)
- 3. (a) Draw and explain the input and output characteristics of a transistor in CB configuration. (5)
- (b) Find the values of collector and emitter currents in a transistor having $I_{CBO} = 3\mu A$ and $\alpha_{dc} = 0.98$, when its base current is $60\mu A$. (5)
- 4. Design a voltage divider bias circuit for transistor to establish the quiescent point as $V_{CE} = 12V$, $I_C = 1.5mA$, stability factor $S \leq 3$, $\beta = 50$, $V_{BE} = 0.7V$, $V_{CC} = 22.5V$ and $R_C = 5.6k\Omega$. (10)

SECTION B

- 5. An amplifier with negative feedback provides an output voltage of 5V with an input voltage of 0.2V. On removal of feedback, it needs only 0.1V input to give the same output. Find the following. (10)
 - a) Gain without feedback.
 - b) Gain with feedback.
 - c) Feedback ratio.
- 6. (a) Draw the circuit diagram of a push-pull amplifier. Explain its operation. Discuss advantages and disadvantages. (5)
- (b) Design a Hartley oscillator to generate a frequency of 150KHz. (5)
- 7. (a) Explain the principle of working of transistor Colpitts oscillator. Draw circuit diagram and briefly function of each component. (5)
- (b) Draw and explain the Collector feedback biasing. (5)

x-x-x