SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++'
Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

23ECT201-ELECTRONIC CIRCUITS

UNIT 1 BJT AND FET BIASING

TOPIC 1 : OPERATING POINT

OPEARTING POINT

Q-point: It is point on load line which represents DC value of V_{CE} and I_C in absence of signal. Best position is mid-point on load line, $V_{CE} = \frac{1}{2} V_{CC}$

▶ For transistor amplifiers the resulting dc current and voltage establish an operating point on the characteristics that define the region that will be employed for amplification of the applied signal.

▶ Since the operating point is a fixed point on the characteristics, it is also called the quiescent point (abbreviated Q-point).

▶ By definition, quiescent means quiet, still, inactive. Figure shows a general output device characteristic with four operating points indicated.

▶ Temperature causes the device parameters such as the transistor current gain (ac) and the transistor leakage current (*ICEO*) *to change.*

▶ *Higher temperatures* result in increased leakage currents in the device, thereby changing the operating condition set by the biasing network. The result is that the network design must also provide a degree of *temperature stability so that temperature changes result* in minimum changes in the operating point.

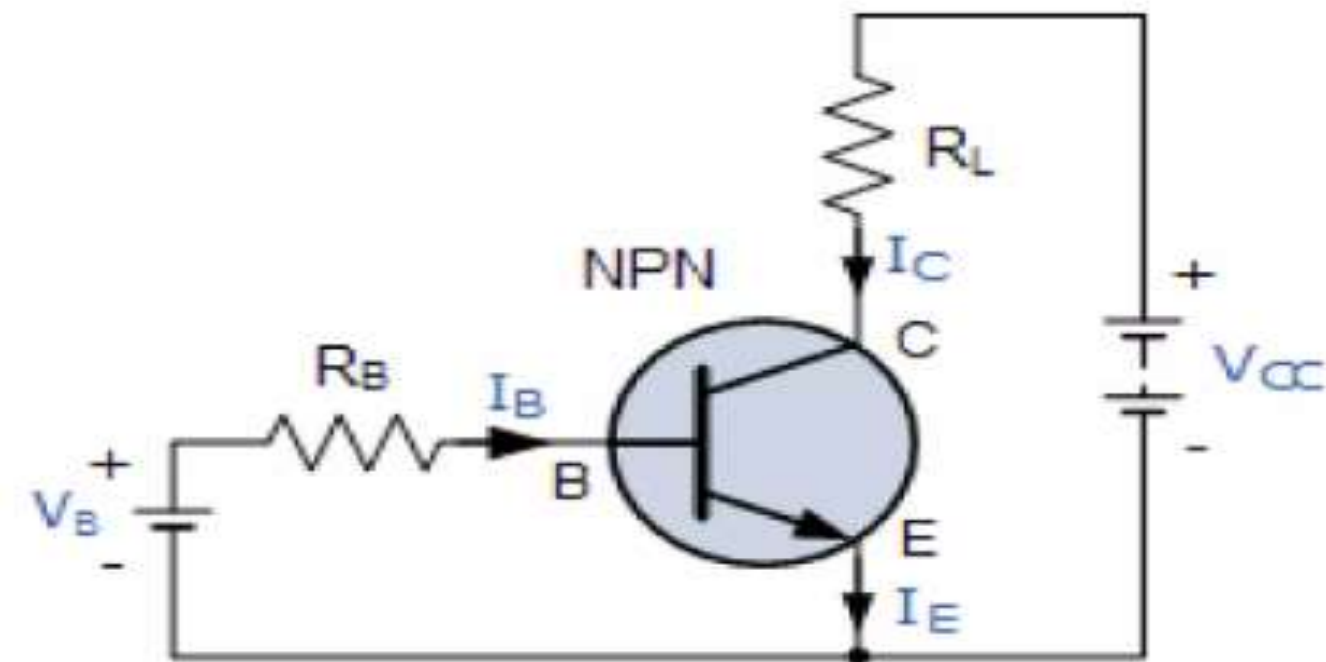▶ This maintenance of the operating point can be specified by a *stability factor, S.*

DC LOAD LINE

▶ Load line: locus of operating point on o/p characteristics of transistor

▶ A line on which operating point moves according to input ac signal
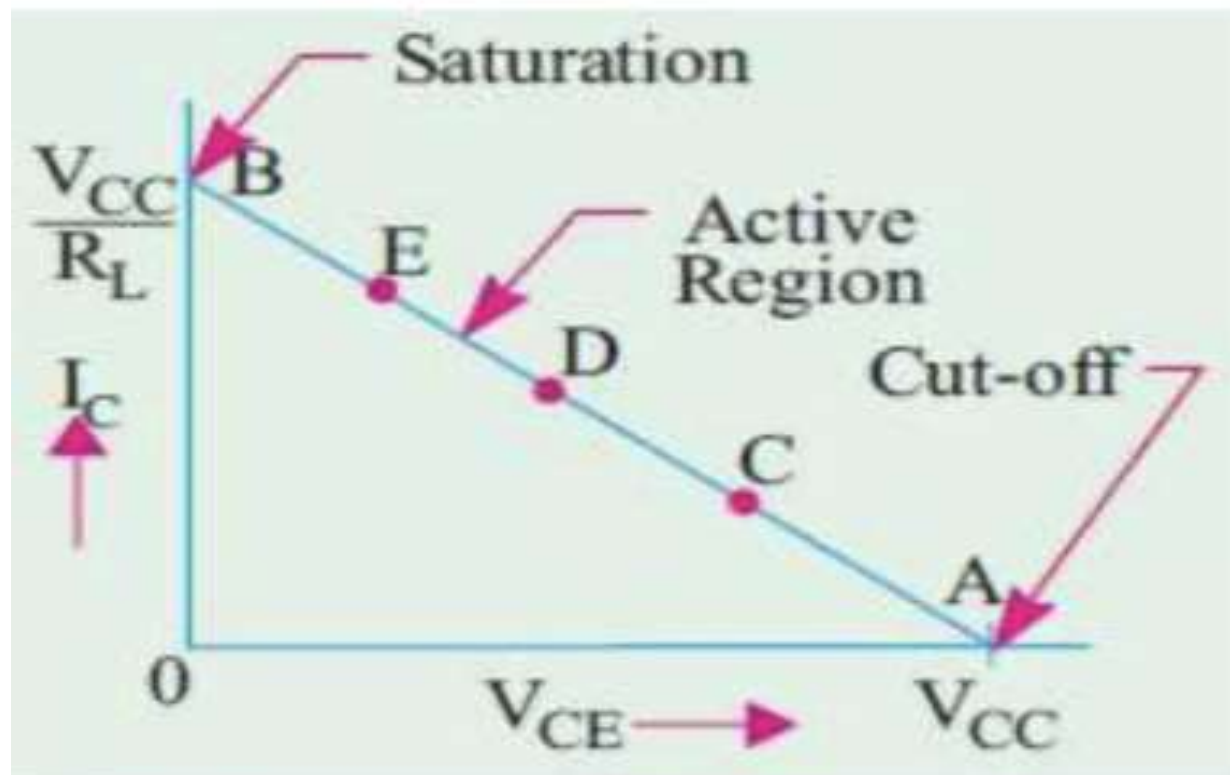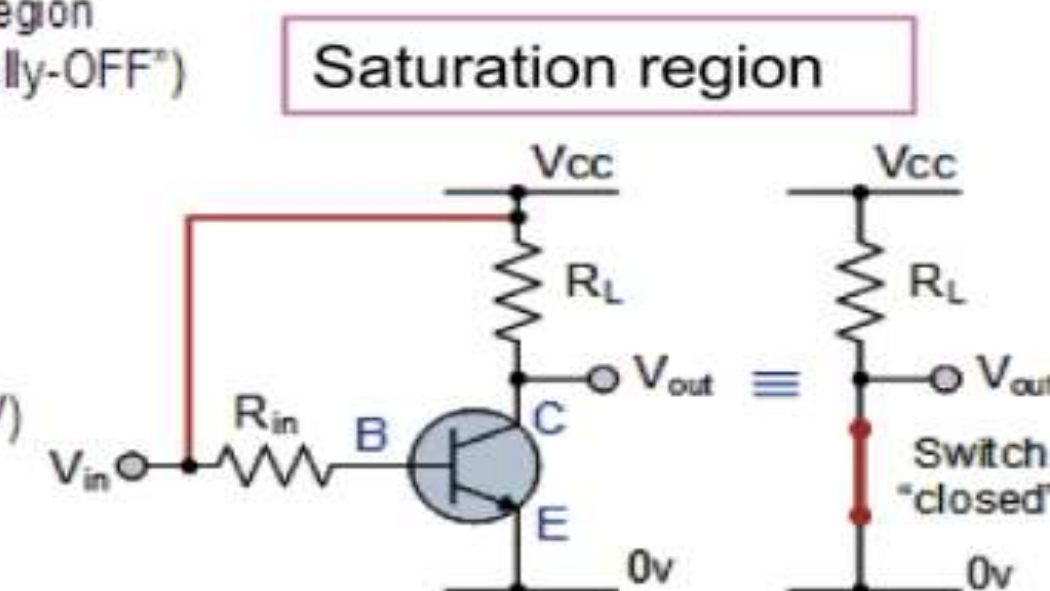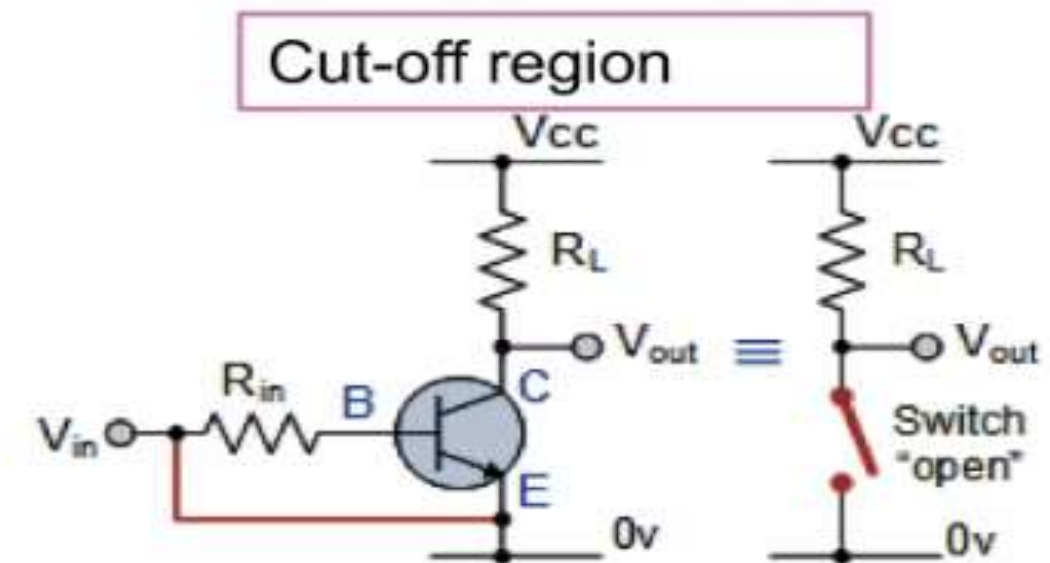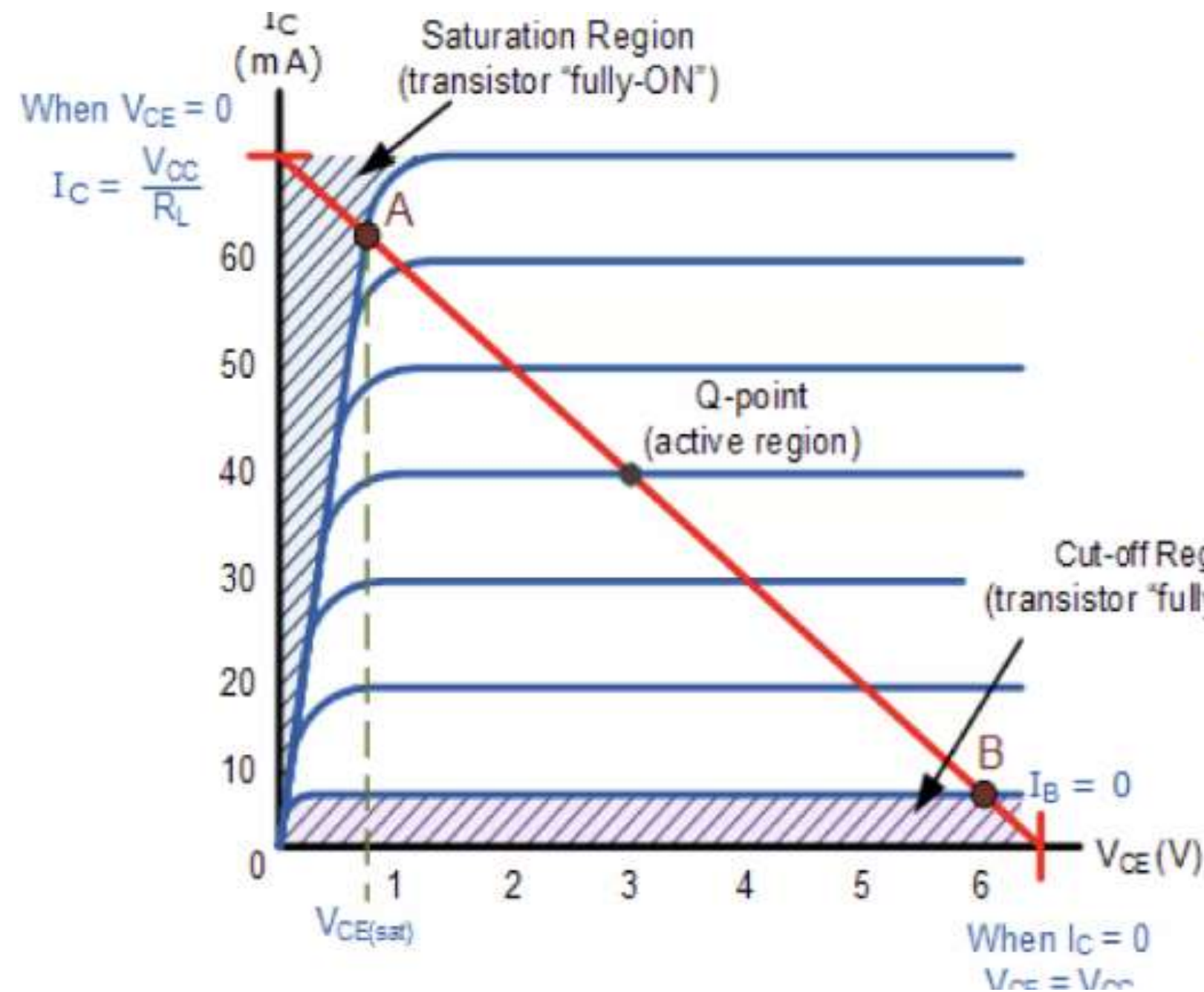

▶ 3

$$V_{CC} = I_C R_L + V_{CE} \qquad \therefore \quad I_C = \frac{V_{CC}}{R_L} - \frac{V_{CE}}{R_L}$$
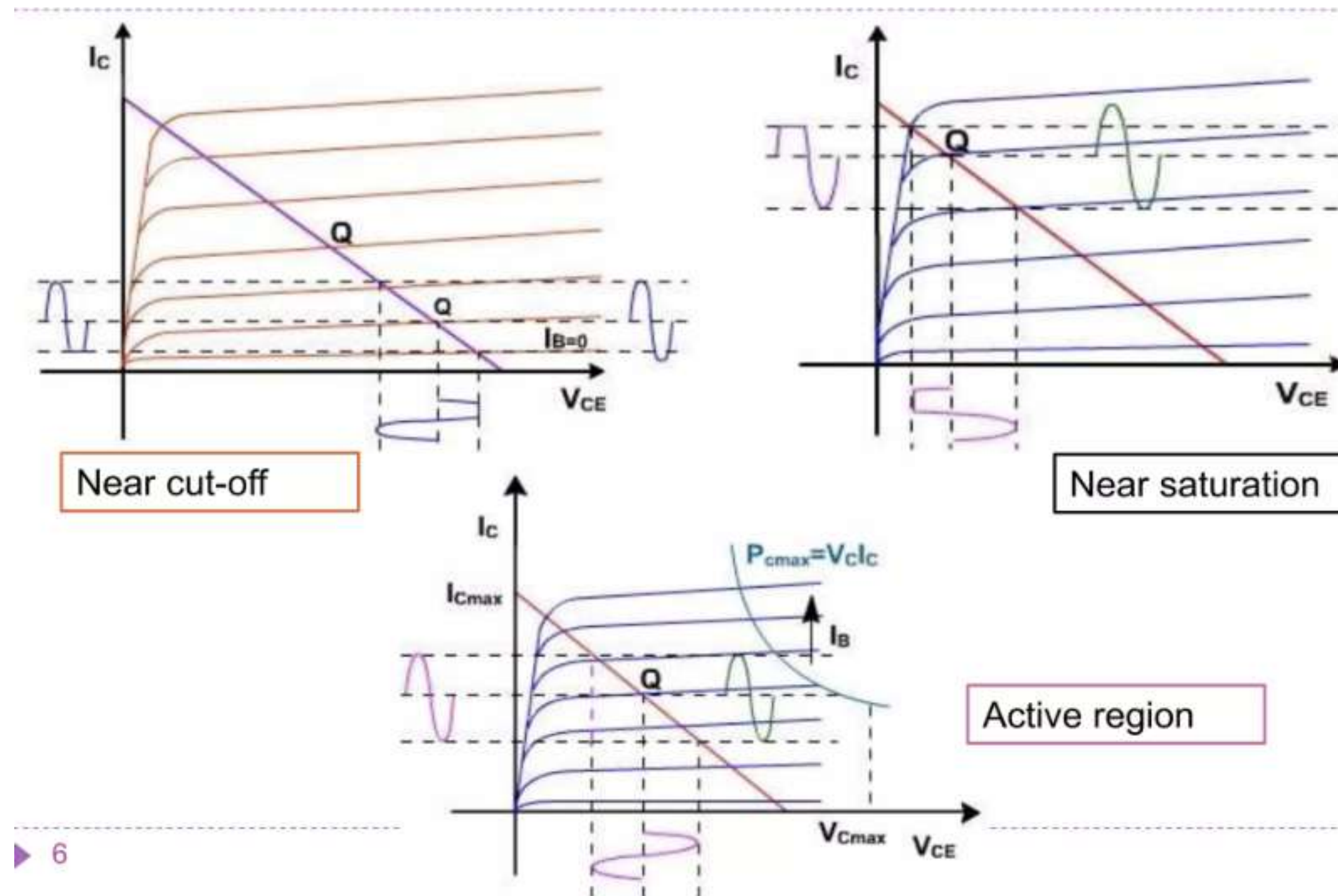
OPEARTING REGION

Near cut-off

Near saturation

Active region

EXAMPLE

1. For CE configuration Vcc = 10 v, Rc = 8k. Draw DC load line. Find Q-point for zero signal if base current is 15µA, β=40
   - Ic = 1.25mA,
   - Zero signal Ic=β I_B = 0.6mA, VCE = 5.2v
2. In transistor ckt Rc= 5k, quiescent current is 1.2mA. Determine Q-point when Vcc=12 v. how will point change when Rc is changed from 5k to 7.5k
   - Operating pt 1: (6 v, 1.2mA)
   - Operating pt 2: (3 v, 1.2mA)

Assessment

Define opearting Point

Q-point: It is point on load line which represents DC value of V_{CE} and I_C in absence of signal. Best position is mid-point on load line, $V_{CE} = \frac{1}{2} V_{CC}$

OPERATING POINT/BJT AND FET BIASING/LAKSHMI S V/ECE/SNSCT