

NAME: _____

PUID: _____

Week 14 Quiz: Bipolar Transistors
ECE 305: Semiconductor Devices
Mark Lundstrom, Purdue University, Spring 2015

Answer the **multiple choice questions** below by choosing the **one, best answer**.

- 1) The high drain voltage region of a MOSFET is called the saturation region. What is the corresponding region of a BJT called?
 - a) The saturation region.
 - b) The forward active region.
 - c) The reverse active region.
 - d) The cut-off region.
 - e) The beyond pinch-off region.

- 2) The low drain voltage region of a MOSFET is called the linear (or ohmic, or triode region) region. What is the corresponding region of a BJT called?
 - a) The saturation region.
 - b) The forward active region.
 - c) The reverse active region.
 - d) The cut-off region.
 - e) The beyond pinch-off region.

- 3) How are the PN junctions biased in the forward active region of an NPN BJT?
 - a) Emitter-base: forward biased. Base-collector: forward-biased.
 - b) Emitter-base: forward biased. Base-collector: reverse-biased.
 - c) Emitter-base: reverse biased. Base-collector: forward-biased.
 - d) Emitter-base: reverse biased. Base-collector: reverse-biased.
 - e) Emitter-base: forward biased. Base-collector: biased in breakdown.

- 4) How are the PN junctions biased in the forward active region of a PNP BJT?
 - a) Emitter-base: forward biased. Base-collector: forward-biased.
 - b) Emitter-base: forward biased. Base-collector: reverse-biased.
 - c) Emitter-base: reverse biased. Base-collector: forward-biased.
 - d) Emitter-base: reverse biased. Base-collector: reverse-biased.
 - e) Emitter-base: forward biased. Base-collector: biased in breakdown.

- 5) Which of the following would be a considered good value of β_{dc} (β_F)?
 - a) 0.099.
 - b) 0.99.
 - c) 1.5.
 - d) 5.
 - e) 100.

- 6) Which of the following would be a considered good value of α_{dc} (α_F)?
- 0.099.
 - 0.99.
 - 1.5.
 - 5.
 - 100.
- 7) Which of the following would be a considered good value of γ_F ?
- 0.099.
 - 0.99.
 - 1.5.
 - 5.
 - 100.
- 8) Which of the following would be a considered good value of α_T ?
- 0.099.
 - 0.99.
 - 1.5.
 - 5.
 - 100.
- 9) Which of the following is the definition of the forward emitter injection efficiency of an **NPN BJT**?
- $\gamma_F = J_{Ep} / (J_{Ep} + J_{En})$.
 - $\gamma_F = J_{En} / (J_{Ep} + J_{En})$.
 - $\gamma_F = J_{Cn} / J_{En}$.
 - $\gamma_F = J_{Cp} / J_{Ep}$.
 - $\gamma_F = 1 - J_{Cp} / J_{Ep}$.
- 10) Which of the following is the definition of the forward emitter injection efficiency of a **PNP BJT**?
- $\gamma_F = J_{Ep} / (J_{Ep} + J_{En})$.
 - $\gamma_F = J_{En} / (J_{Ep} + J_{En})$.
 - $\gamma_F = J_{Cn} / J_{En}$.
 - $\gamma_F = J_{Cp} / J_{Ep}$.
 - $\gamma_F = 1 - J_{Cp} / J_{Ep}$.

11) Which of the following is the definition of the base transport factor of an **NPN** BJT?

a) $\alpha_T = J_{Ep} / (J_{Ep} + J_{En})$.

b) $\alpha_T = J_{En} / (J_{Ep} + J_{En})$.

c) $\alpha_T = J_{Cn} / J_{En}$.

d) $\alpha_T = J_{Cp} / J_{Ep}$.

e) $\alpha_T = 1 - J_{Cp} / J_{Ep}$.

12) Which of the following is the definition of the base transport factor of a **PNP** BJT?

a) $\alpha_T = J_{Ep} / (J_{Ep} + J_{En})$.

b) $\alpha_T = J_{En} / (J_{Ep} + J_{En})$.

c) $\alpha_T = J_{Cn} / J_{En}$.

d) $\alpha_T = J_{Cp} / J_{Ep}$.

e) $\alpha_T = 1 - J_{Cp} / J_{Ep}$.