

**ASSIGNMENT-5**

Topic	Assignment Posted On	Submission Due On
Transistor Fundamentals	13.04.2016	18.04.2016

**Note:**

- Write the answers legibly and neatly.
- Use a different color pen for writing questions and draw a horizontal line at the end of each answer
- Leave left margin on each page
- Write only on one side of the page. This will facilitate you to use the other side to add extra notes or to incorporate any corrections to your solutions after verifying them with the solutions posted on course web page.
- Your objective of writing assignments is not for the sake of submitting, only to get assignment marks. Writing assignments is a part of learning process, after listening to class lectures. After all, You will be referring to class notes and assignment notes for MSEs and ESE.
- Make an honest effort to solve the assignment problems. In case of difficulty, discuss with friends/Teacher and refer to solutions as a last resort. Finally, rework the solutions on your own for submission
- You will be graded based on the quality of your work. Please do not let your efforts go in vain
- Class notes and Assignment will keep you in comfortable position in MSEs and ESE

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**Read carefully, the expectations from each answer and present them in detail**

1. Draw the symbols of NPN and PNP transistors and mention different transistor currents and voltages indicating the polarity
2. Explain the operation of NPN transistor  

[You are expected to cover: (i) Physical structure of the transistor indicating terminals, junctions, physical widths and doping levels, (ii) modes of operation based on biasing conditions of  $J_{EB}$  and  $J_{CB}$  (iii) operation of transistor in the active mode (iv) What happens when  $J_{EB}$  is forward biased (v) What happens when  $J_{CB}$  is reverse biased (vi) current components  $I_E$ ,  $I_B$  and  $I_C$  (vii) expression for  $I_C$  (viii) Why the name transistor is given (ix) circuit symbol of NPN transistor mentioning currents and voltages]
3. Explain Early effect or base width modulation
4. Define  $\alpha$ ,  $\beta$  and  $\gamma$  of a transistor and derive the relation between them.
5. Explain the input and output characteristics of a transistor in CE configuration with reference to early effect.
6. Explain the input and output characteristics of a transistor in CB configuration with reference to early effect.
7. Compare CB, CE, CC transistor configurations.

8. Calculate  $I_C$  and  $I_E$  for a transistor that has  $\alpha_{dc}=0.98$  and  $I_B=100\mu A$ . Find the value of  $\beta_{dc}$  of the transistor.
9. The current gain of a transistor in CE mode ( $\beta$ ) is 49. Calculate its CB current gain ( $\alpha$ ). Also find the collector current when the emitter current is 3mA.

**Instruction: Submit the solutions during the lunch break on or before due date @ Room No: B-I-208**  
Faculty: *K. Ashoka Reddy, Room #: BI-208*