INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
DEPARTMENT OF ELECTRONICS & ELECTRICAL ENGINEERING

EE 101: Electrical Sciences

Tutorial-7

*(First question is the **Pre-Tutorial Assignment problem** to be done in the space provided.)*

Name: Roll No.: Tutorial Group:

Question-1(Pre Tutorial Question): Three star connected impedances Z_1 = 20 +j37.7 Ω per phase are in parallel with three delta connected impedances Z_2 = 30 – j159.3 Ω per phase. The line voltage is **398 volts rms.** Find the line currents, power factor, power and reactive volt ampere taken by the combination. **(Hint: Convert impedances connected in delta into their equivalent star connected configuration. For a balanced network, $Z_{Star} = \frac{Z_{Delta}}{3}$)**

Question-2: In the balanced three phase system of Fig. 1, let $Z_P = 12 + j5\ \Omega$ and $\mathbf{I_{bB} = 20\angle 0^0}$ **A rms** with (+) phase sequence. If the source is operating with a power factor of 0.935, find (a) R_w (b) $\mathbf{V_{bn}}$ (c) $\mathbf{V_{AB}}$ (d) complex power supplied by the source.

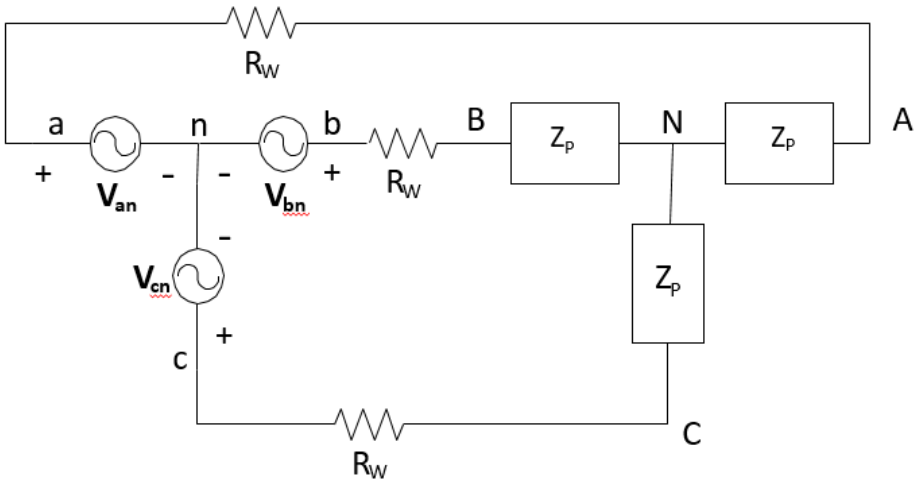
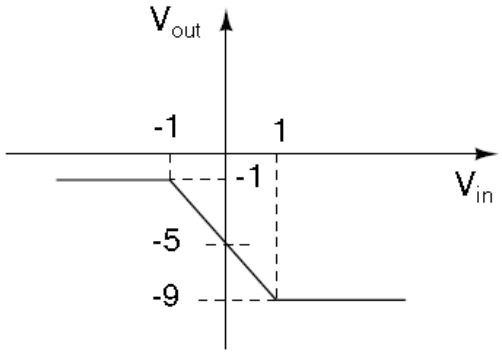


Figure -1

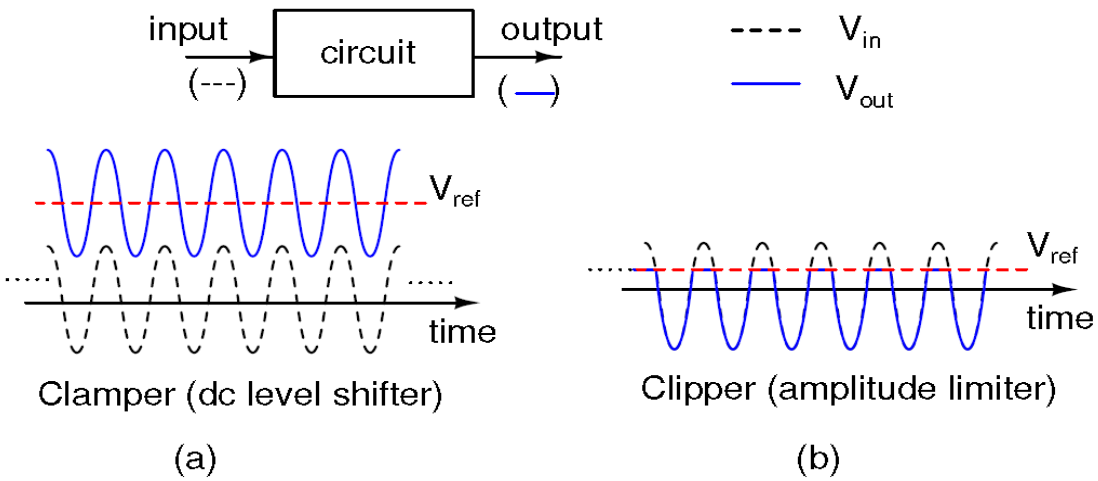
Question-3:

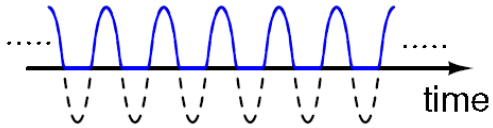
Transfer characteristics of a circuit are shown below.



Draw the output (as a function of time) of this circuit for the following inputs: 5+cosωt, 0.2cosωt, 1.2cosωt

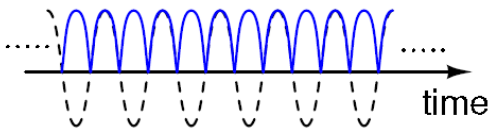
Question-4:





Half-wave Rectifier

(c)



Full-wave Rectifier

(d)

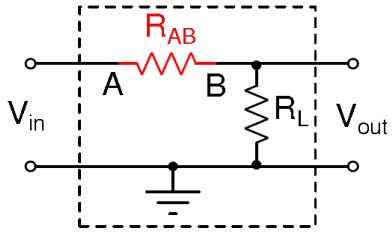
Draw the transfer (output amplitude w.r.t. input amplitude) characteristics of the above circuits.

Question-5:

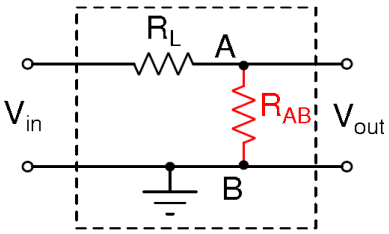
A voltage controlled resistor R_{AB} has the following characteristics.

$$R_{AB} = \begin{cases} \infty & \text{for } V_{AB} < 0 \\ 0 & \text{for } V_{AB} \geq 0 \end{cases}$$

Plot the transfer characteristics of the following circuits. R_L is a normal resistor.



(a)



(b)