

COURSE: U14EI 205 - BASIC ELECTRONICS ENGINEERING	ECE-I, Semester-II
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ASSIGNMENT-3

Topic	Assignment Posted On	Submission Due On
PN Junction Diode as Rectifier	20.02.2016	25.02.2016

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.
- After all, You will be referring to class notes and assignment notes for MSEs and ESE. 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.
- 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

1. Draw the block diagram of an adapter (also called “Regulated Power Supply”) and explain the function of each block.
2. Draw the circuit diagram and explain the working of Half Wave Rectifier (HWR).
[You are expected to cover: (i) Ckt diagram of HWR, (ii) Ckts showing current conduction path through Load during +ve and –ve half cycles of v_i (iii) Input v_i and Output voltage v_o waveforms, (iv) comment on V_{dc} and v_{rms} (derivation not needed: write the formulae and give the values), (v) comment on ripple factor (derivation not needed: write the formula and give the value), (vi) comment on rectification efficiency (write the formula and give the value), (vii) comment on PIV]
3. Derive expressions for ripple factor (r), rectification efficiency (η) of HWR and PIV of the diodes to be used.
[You are expected to: (i) draw Ckt diagram of HWR, (ii) Input v_i and Output voltage v_o waveforms, (iii) after derivation, you are expected to comment on r , η and need for improvement in values of those parameters, PIV]
4. The primary to secondary turns ratio of a transformer used in a HWR is 20:1. If the primary is connected to the power mains: 220V, 50Hz, calculate D.C voltage across the 1K Ω load resistor. Also find the diode current.
[Ans: 4.95V, 4.95mA]

5. The primary to secondary turns ratio of a transformer used in a HWR is 12:1. The primary is connected to the power mains: 220V, 50Hz. Assuming the diode resistance in forward bias to be zero, calculate the D.C voltage across the load resistor. What is the PIV of the diode? [Ans: $V_{dc}=8.24V$, $PIV=25.9V$]
6. With the help of a neat circuit diagram explain the working principle of a centre tapped Full Wave Rectifier.
[You are expected to cover: (i) Ckt diagram of FWR, (ii) Ckts showing current conduction path through Load during +ve and -ve half cycles of v_i (iii) Input v_i and Output voltage v_o waveforms, (iv) comment on V_{dc} and v_{rms} (derivation not needed: write the formulae and give the values), (v) comment on ripple factor (derivation not needed: write the formula and give the value), (vi) comment on rectification efficiency (write the formula and give the value), (vii) comment on PIV]
7. Derive expressions for ripple factor (r), rectification efficiency (η) of a Full Wave Rectifier (FWR) and the PIV of the diodes to be used.
[You are expected to: (i) draw Ckt diagram of FWR , (ii) Input v_i and Output voltage v_o waveforms, (iii) after derivation, you are expected to comment on r , η and need for improvement in values of those parameters, PIV]
8. With the help of a neat circuit diagram explain the operation of a Bridge Rectifier. Also define PIV and find PIV for HWR, Center tapped FWR and Bridge Rectifier.
[You are expected to cover: (i) Ckt diagram of Bridge-FWR, (ii) Ckts showing current conduction path through Load during +ve and -ve half cycles of v_i (iii) Input v_i and Output voltage v_o waveforms, (iv) comment on V_{dc} and v_{rms} (derivation not needed: write the formulae and give the values), (v) comment on ripple factor (derivation not needed: write the formula and give the value), (vi) comment on rectification efficiency (write the formula and give the value), (vii) Ckt diagram of HWR, center-tapped FWR and find PIV in all three cases and comment on PIV values]
9. Compare the performance of HWR, Center-tapped FWR and Bridge Rectifier. Mention the advantages and disadvantages of Center-tapped FWR and Bridge rectifiers
[You are expected to compare them based on parameters (i) Number of diodes required, (ii) V_{dc} , (iii) v_{rms} , (iv) ripple factor, (v) max.rectification efficiency, (vi) PIV of diodes, (vii) ripple frequency and (viii) other parameters, if any]
10. The turns ratio of a transformer used in a Bridge Rectifier is 12:1. The primary is connected to the power mains: 220V, 50Hz. Assuming the diode voltage drops to be zero, (a) calculate the D.C voltage across the load resistor. (b) What is the PIV of the diode? If the same dc voltage is obtained by using Center tapped FWR, what is PIV?
[Ans: (a)16.48V (b)25.9V (c)51.8V]

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