EEE Overview 2024

(prev. year questions | optimal range 2016-21)

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Disclaimer

This is by no means, any sorts of suggestion. Just the curated set of topics derived from previous year's questions, sorted with latest in preference, without any sorts of guaranty. Copyrighting is totally allowed under CC-0 act. Also thanks to Mehedi Hasan for collaboration. Here star mark represents repetition rate! A bit of luck this time, I guess.

Further questions (2015 and earlier) are also available on rising flare. Feel free to check!

Chapter 5 (semiconductor)

let's define...

1. semiconductor
2. p-n junction
3. intrinsic and extrinsic
4. behavior of pn junction under forward and reverse biasing

let's illustrate...

1. effect of temperature on semiconductor
2. V-I characteristics of pn
3. mechanism of hole current

Chapter 6 (diode)

let's define…

1. crystal diode **
2. ripple factor **
3. zener diode

let's illustrate…

1. crystal diode as a switch **
2. ripple factor of full wave < half wave **
3. full wave rectifier is twice as effective as half wave **
4. filter circuits (capacitor, choke input, capacitor input filter) **
5. full wave bridge rectifier (working strategy, pros and cons)
6. crystal diode vs vacuum diode (pros and cons)
7. how zener diode maintains constant voltage across the load.
8. Equivalent circuits of crystal diode (draw and discuss)

a bit of math…

1. Derive an expression for the efficiency of a full wave rectifier.
2. A crystal diode having internal resistance $40\,\Omega$ is used for half-wave rectification. If the applied voltage $V = 60\sin Wt$ and load resistance is $500\,\Omega$. Find *
   I. I_{max}, I_{dc}, I_{rms}
   II. a.c. power input and d.c. power input
   III. d.c. output voltage
   IV. efficiency of rectification
3. The four diodes used in a bridge rectifier circuit have forward resistances which may be considered constant at 1Ω and infinite reverse resistance. The alternating supply voltage is 300V r.m.s. and load resistance is 250 2. Calculate (i) mean load current and (ii) power dissipated in each diode. *
4. An a.c. supply of 250V is applied to a half-wave rectifier circuit through a transformer of turn ratio 10:1. Find,
   I. the output d.c. voltage
   II. the peak inverse voltage
   (Consider the diode to be ideal)
5. A half wave rectifier uses a transformer turns ration 5:2. If the primary voltage is 250 V (r.m.s.), find,
   I. d.c. output voltage
   II. peak inverse voltage
   (Consider the diode to be ideal)

Chapter 7 (special diodes)

let's define…

1. photo diode **
2. tunnel diode
3. LED (short note)

let's illustrate…

1. working principal and applications of photo diode with example **
2. tunneling effect and V-I characteristics of tunnel diode *

Chapter 8 (transistors)

let's define…

1. transistor **

let's illustrate…

1. transistor vs vacuum tube (advantages, disadvantages) *
2. three transistor connections comparison
3. why is collector current is slightly less than emitter current

a bit of math…

1. expression for collector current in common emitter *
2. expression for collector current in common base
3. expression for collector current in common base (*)
4. input output characteristics of common-emitter
5. a transistor is connected in common-emitter (CE) configuration in which collector supply is 20V and the voltage drop across 800Ω load resistance connected in the collector circuit is 0.5V. If α=0.96, calculate: *
   I. collector-emitter voltage
   II. base current
6. The collector leakage current in a transistor is 250 μA in CE arrangement. If the transistor is connected in CB arrangement, what will be the leakage current? Given that β = 100.
7. A Germenium transistor is to be operated at zero signal I_c = 1 mA. If the collector supply V_{cc} = 15 V, what is the value of R_B in the base resistor method. Given that β = 120.
8. A transistor employs a 4 kΩ load and V_{cc} = 13 V. What is the maximum input signal if β = 100? Given V_{knee} = 1V and a change of 1V in V_{BE} causes a change of 5mA in collector current.

Chapter 14 (oscillators)

let's define…

1. sinusoidal oscillator *
2. tank circuit *
3. Oscillatory circuit

let's illustrate…

1. advantages of sinusoidal oscillator *
2. sinusoidal oscillator and alternator (difference) *
3. tuned collector (construction and circuit operation)
4. colpitt's (construction and circuit operation)
5. hartley oscillator (construction and circuit operation)
6. limitation of LC and RC *
7. Why is amplifier circuit necessary in an oscillator

a bit of math…

1. 1 pF capacitor is available. Choose the inductor values in a *Hartley oscillator* so that f= 1 MHz and m_v = 0.2. *
2. 1 MHz inductor is available. Calculate the capacitor values in a Colpitts oscillator so that f= 1 MHz and m_v = 0.25.

Chapter 19 (field effect transistors)

let's define…

1. JFET **
2. MOSFET *

let's illustrate…

1. construction and working principal of JFET **
2. advantages of JFET
3. circuit operation of D-MOSFET *
4. JFET vs bipolar transistor
5. characteristics of D-MOSFET vs E-MOSFET
6. FET is better than BJT
7. Why JFET is called constant current source?

Chapter 20 (rectifiers)

let's define…

1. SCR *

let's illustrate…

1. construction and operation of SCR *
2. SCR as a mechanical switch (process)

Chapter 21 (power electronics)

let's define…

2. triac *
3. diac

let's illustrate…

1. construction and operation of UJT **
2. construction and operation of triac circuit *
3. operating principle of diac
4. V-I characteristics of a diac
5. diac as lamp dimmer

End Notes

Our previous year's questions may contain chapter 9 (Transistor Biasing) which is out of scope of our syllabus so such questions are avoided,

1. faithful amplification
2. transistor biasing
3. stability factor
4. voltage divider bias

and forgive my mistakes. . .