

Instructions :

- There are **Nine** Questions in this Paper.
- Attempt **Five** questions in all.
- Question No. 1 is Compulsory.**
- The marks are indicated in the right hand margin.

1. Answer the following questions: 2×7=14

- Difference between BJT and MOSFET.
- Define thermal run way.
- Difference between depletion mode and enhancement mode MOSFET.
- List the most important SCR parameters for low-current devices.
- Emitter saturation voltage of UJT.
- List the most important parameters of operational amplifier and their typical values.
- Define the Pinch-off voltage JFET.
- Define flat-band voltage.
- State the applications of light emitting diode.
- Why the BJT dimensions of Emitter, Base and Collector are not same?

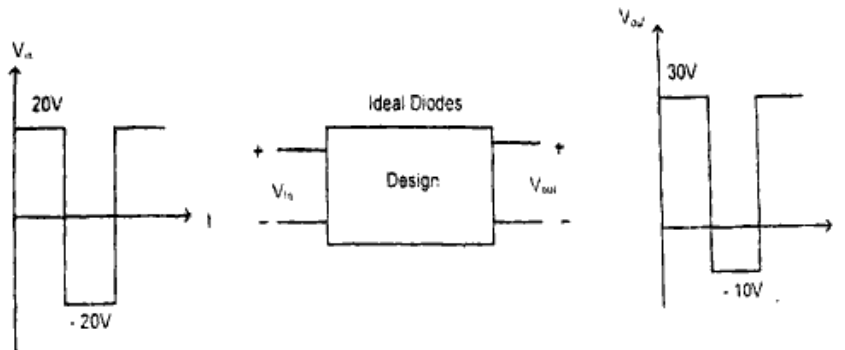


Figure 3

- Briefly explain the small signal model of JFET.
 - An integrator using op-amp has following component values. $R_i = 1k\Omega$, $R_f = 100k\Omega$ and $C_f = 0.1\mu F$. A 1kHz square wave applied to integrator. The amplifier uses $\pm 15V$ supply and output saturates at $\pm 14V$ if input alternates between $\pm 5V$ then. 14
 - Determine the maximum change in output
 - Determine the maximum slew rate. 8+6=14
- Define the gate power dissipation and explain its importance in SCR.
 - Explain the operation of centre tapped full wave rectifier. And calculate the rms load current and voltage for a sinusoidal input. 7+7=14

2. (a) Derive and explain an intrinsic carrier concentration (n_i) of a semiconductor.

(b) Explain the operation and characteristics of light emitting diode. $6+8=14$

3. (a) For the circuit shown in Figure 1, determine

- d.c. output voltage
- rectification efficiency
- peak inverse voltage
- output frequency

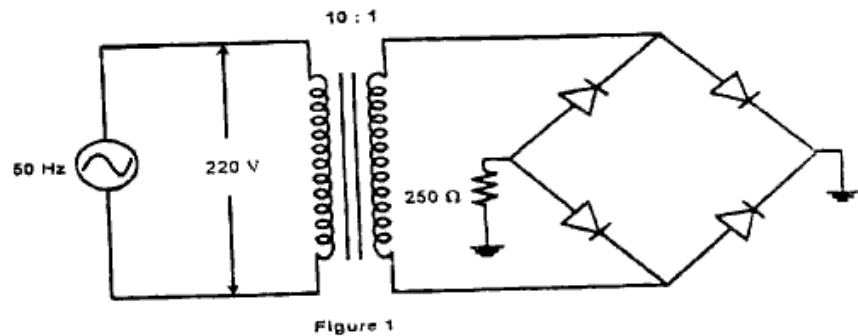


Figure 1

(b) Explain the operation of p^+n silicon diode at equilibrium condition. Also derive the expression for the following :

- Maximum electric field (E_{max})
- Depletion width (W)
- Built-in potential (V_{bi}) $8+6=14$

4. (a) Accurately analyze the collector-to-base bias circuit is shown in Figure 2 to determine the I_B , I_C and V_{CE} when

- $\beta = 50$ and

(ii) $\beta = 200$ Assume $V_{BE} = 0.7$ V.

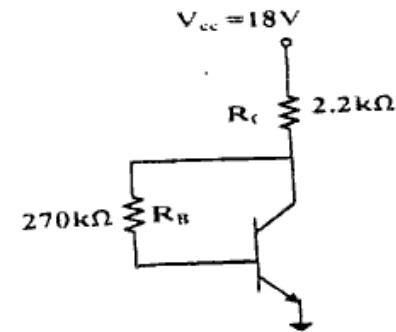


Figure 2

(b) Sketch typical BJT common-emitter input and output characteristics. Explain the shapes of the characteristics. $8+6=14$

5. (a) Draw the two biasing circuits for JFET and explain. $8+6=14$

(b) Derive the gain expression of an integrator and a differentiator using op-amp. $8+6=14$

6. (a) Explain the basic operation and characteristics of n -channel depletion type MOSFET.

(b) Sketch a 180° phase control for an SCR. Draw the load waveform and explain the circuit operation. $8+6=14$

7. (a) Draw Sketches to show the basic construction and equivalent circuit of a unijunction transistor (UJT). Briefly explain the device operation.

(b) Design a clamper to perform the function shown in the Figure 3 shown below $8+6=14$