1. A pure Si doped with donar type impurity to an extent of 4 impurity atoms per 1 million (106) Si atoms. Determine the conductivity of doped semiconductor, if all the donar atoms are ionized, given concentration of Si is 10^{22} atoms / cm^3

(a) 3.2 $(\Omega.cm)^{-1}$

(b) 2.08 $(\Omega.cm)^{-1}$

(c) 8.32 $(\Omega.cm)^{-1}$

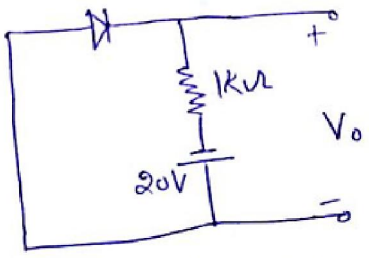
(d) 24.32 $(\Omega.cm)^{-1}$

2. Consider a photodiode is illuminated with a light of wavelength of 800nm of light. If the quantum efficiency is 90% then determine the responsivity of the photodiode. (Given : h = $6.6x10^{-34}$ in MKS)

(a) 1.02 A/W (b) 0.58 A/W

(c) 0.9 A/W (d) 0.8 A/W

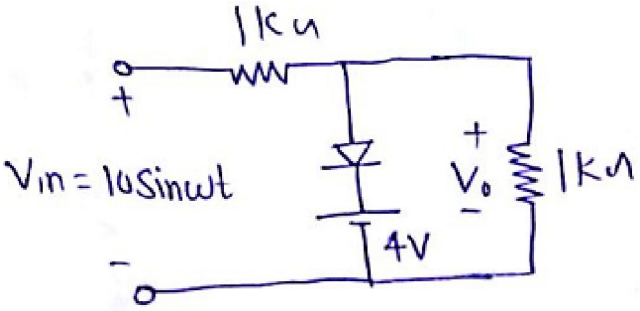
3. Determine the value of V_0 in the given circuit, if the diode is ideal.

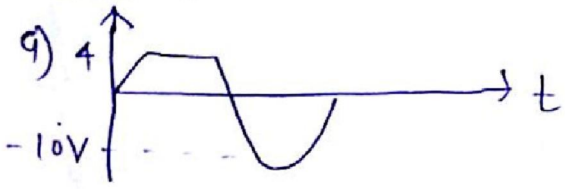


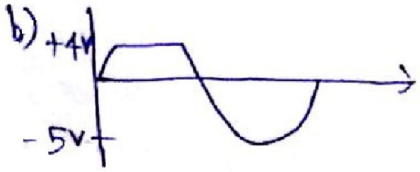
(a) -20V (b) 0V

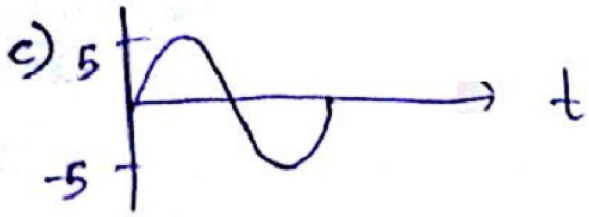
(c) 20V (d) 0.7V

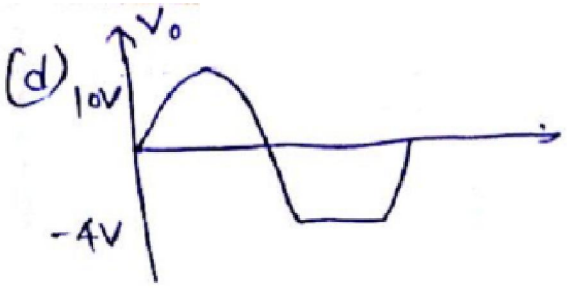
4. The output waveform in the given circuit, if the diode is ideal.



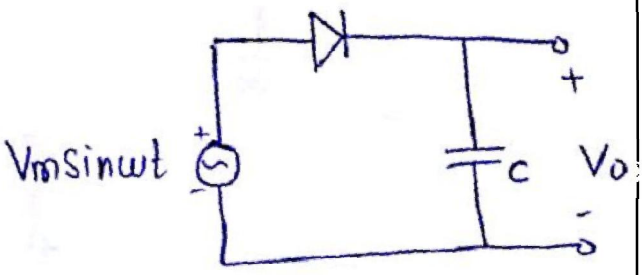








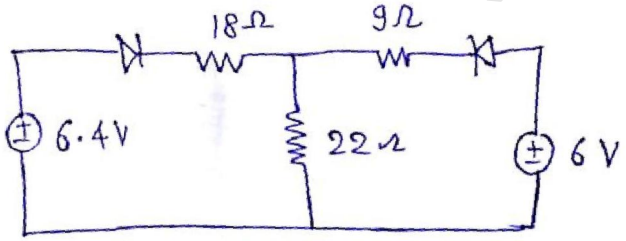
5. In the given circuit, if diode is ideal, determine the value of V_0 at steady state.



(a) 0V (b) 2Vm Volt

(c) Vm Volt (d) -Vm Volt

6. If the threshold voltage of each diode is 0.7V then determine the state of the diodes in the given circuit.



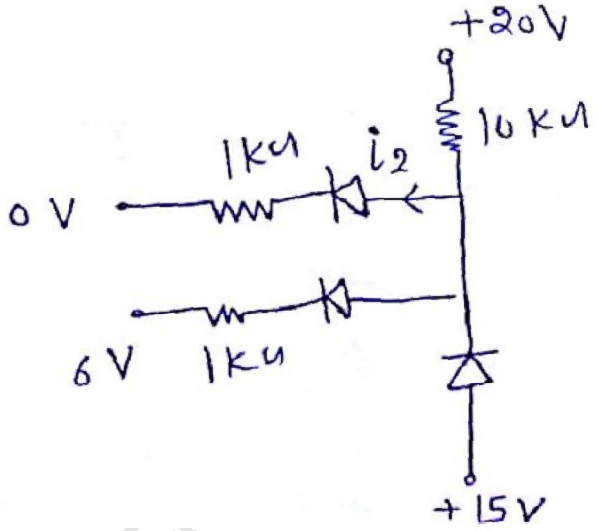
(a) D_1 is ON, D_2 is Off

(b) D_1 is Off, D_2 is ON

(c) Both is ON

(d) Both is Off

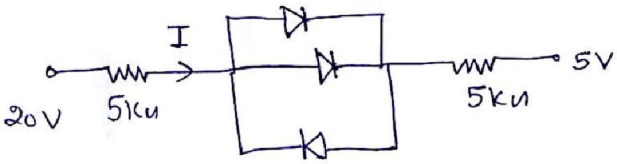
7. If $V_D = 0.7V$, the current i_2 in the given circuit is



(a) 3.6 mA (b) 6 mA

(c) 5.2 mA (d) 4.3 mA

8. For the following network determine the current, if all the diode is ideal.



(a) 1.5 mA (b) 0.75 mA

(c) 0 mA (d) 3 mA

9. Find the correct match between Group I and Group II

Group I

E. Varactor Diode

F. PIN diode

G. Zener diode

H. Schottky diode

Group II

1. Voltage Reference

2. High Frequency Switch

3. Tuned Circuits

4. Current Controlled Attenuator

(a) E-4, F-2, G-1, H-3

(b) E-2, F-4, G-1, H-3

(c) E-3, F-4, G-1, H-2

(d) E-1, F-3, G-2, H-4

10. The capacitance of a p_n junction is 10 picofarad when it is biased with a reverse biased voltage of 3 Volt. Find the capacitance when it is biased with a reverse biased voltage of 15 Volts. Given built-in potential is 1Volt.

(a) 10 pf (b) 8 pf

(c) 20 pf (d) 5 pf

11. When a p_n junction diode is in reverse biased mode, the current flowing through the junction is:

(a) Diffusion current

(b) Drift current

(c) Combination of diffusion and drift current

(d) None of the above

12. Due to the body effect, the threshold voltage of a MOSFET is :

(a) Increases

(b) Decreases

(c) Remains constant

(d) None of the above

13. The intrinsic concentration of a pure Si bar is $1.5 \times 10^{10}/cm^3$, at 300K. Then determine the concentration of Si bar at a temperate 476K, if energy gap is maintained constant.

(a) $2.5 \times 10^{10}/cm^3$

(b) $3 \times 10^{10}/cm^3$

(c) $1.5 \times 10^{10}/cm^3$

(d) $1.5 \times 10^{11}/cm^3$

14. Intrinsic concentration of a Si bar is $1.5 \times 10^{10}/cm^3$, it is doped with a p-type impurity of doping concentration $1 \times 10^{14}/cm^3$, Determine the concentration of electron.

(a) $1.5 \times 10^{6}/cm^3$

(b) $2.25 \times 10^{6}/cm^3$

(c) $1 \times 10^{6}/cm^3$

(d) $1.5 \times 10^{10}/cm^3$

15. Silicon is doped with 10^{18} Phosphorous atoms/cm^3 then the shift between the energy level of extrinsic and intrinsic silicon is

(a) 0.11 ev (b) 0.61 ev

(c) 0.41 ev (d) 0.81 ev

16. The linear hole concentration

profile in a piece of silicon is given as $P(x) = (-10^{18} x + 10^{19})$ per cm^3. Determine diffusion hole constant if a diffusion current density 1 mA/ cm^2 is required.

(a) 1.25×10^{-3} cm^2 / sec

(b) 3.25×10^{-3} cm^2 / sec

(c) 6.25×10^{-3} cm^2 / sec

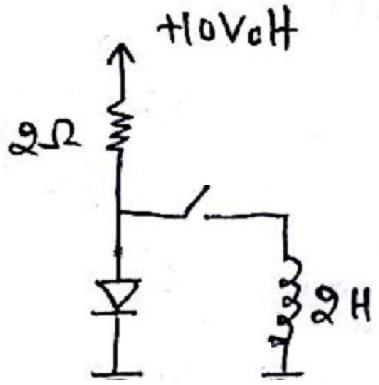
(d) 8.25×10^{-3} cm^2 / sec

17. The doping concentration on p side and n side of an abrupt p-n junction are $N_A = 9x10^{18}$ / cm^3 and $N_D = 2.7 \times 10^{19}$ / cm^3 . If the width of depletion layer on p-side is 3μm, then determine the width of depletion layer on n-side.

(a) 3μm, (b) 2μm,

(c) 4μm, (d) 1μm

18. In the given circuit the forward threshold voltage of diode is 0.7 Volt, if at t = 0 the switch is closed then determine time when the current I_D becomes zero.



(a) 1.66 second (b) 3.66 second

(c) 2.66 second (d) 4.66 second

19. A Silicon sample is doped with n-type impurity of $2.3x10^{17}$ cm^{-3} has resistance of 2 kΩ. The sample has a dimension of 4μm x 8μm If $\mu_n = 1300$ cm^2 / v-sec then determine the doping efficiency. Given length of Silicon is 10μm.

(a) 0.1% (b) 1%

(c) 0.001% (d) 0.01%

20. An n-channel JFET having pinch off voltage is -6 Volt, $I_{DSS} = 10$mA and $I_D = 2$mA. Then determine the maximum value of trans-conductance.

(a) 1.49 mA / Volt

(b) 3 mA / Volt

(c) 3.333 mA / Volt

(d) 0.333 mA / Volt

21. The Fermi level of a hypothetical material is 2.6ev, then determine the velocity of electron at Fermi level.

(a) 1.94×10^5 m/sec

(b) 9.14×10^6 m/sec

(c) 9.14×10^5 m/sec

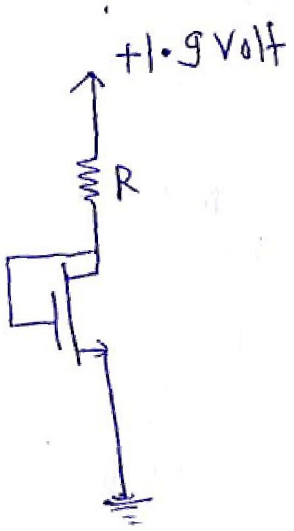
(d) 1.94×10^6 m/sec

22. If the α of a transistor changes 1% from its nominal value of 0.95. Then the percentage change in β will be

(a) 30% (b) 25%

(c) 15% (d) 20%

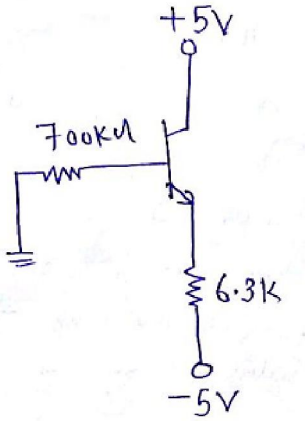
23. For the circuit shown in fig. find the value of R_D so that $V_{DS} = 1$ Volt. The MOSFET has $V_{th} = 0.5V$ $\mu_n Cox = 0.4$ mA/V², W/L = 4



(a) 3.5 kΩ (b) 3 kΩ

(c) 5 kΩ (d) 4.5 kΩ

24. For the given circuit, if voltage across base terminal is -2 Volt, then determine the value current gain β



(a) 100

(b) 125

(c) 50

(d) Can not be determine

25. Determe the unity gain frequency of the transistor if capacitance at base-emitter junction is 30 pico farad and the collector current is 2mA at the room temperate. (Neglect the capacitance at collector-base junction).

(a) 327 MHz (b) 408 MHz

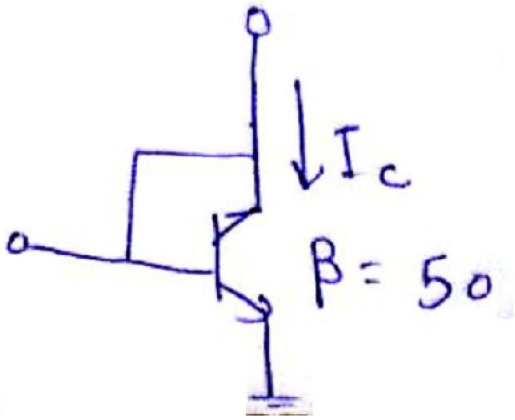
(c) 517 MHz (d) 618 MHz

26. A transistor operating in CB configuration has $I_C = 2.98$ mA, $I_E = 3$mA and $I_{CO} = 0.01$mA. What current will flow in the collector circuit of this transistor when connected in CE configuration with a base current of 30μA

(a) 3.97 mA (b) 2.98 mA

(c) 2.97 mA (d) 3.96 mA

27. For a Si transistor as shown in the fig. $V_{BE} = 0.7V$. Given reverse saturation current of the junction is 400nA at room temperature. The value of I_C is



(a) 274.5 mA (b) 285 mA
(c) 255.7 mA (d) 240.15 mA

28. For a Si semiconductor, $\mu_n = 1300$ cm^2/v-sec $\mu_p = 500$ cm^2/v-sec and $n_i = 1.5 \times 10^{11}$/cm^3. The maximum resistivity will be.

(a) 20.17 kΩ cm

(b) 25.84 kΩ cm

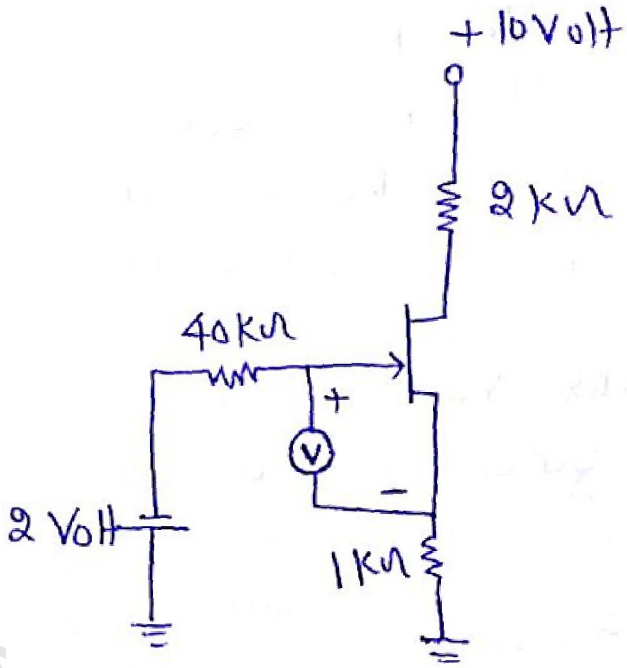
(c) 32.33 kΩ cm

(d) 28.84 krΩcm

29. For the given circuit determine the reading of Voltmeter

Given $I_{DSS} = 10$mA

$I_{DS} = 2$mA



(a) -1 Volt

(b) -2 Volt

(c) -3 Volt

(d) None of the above

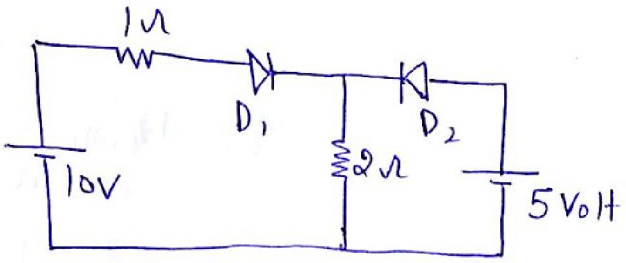
30. For a Si, it is given that $n_i = 1.5 \times 10^{10}$/cm^3 $\mu_n = 1300$ cm^2/v-sec and $\mu_p = 500$ cm^2/v-sec, then the fraction of drift current due to electron is :

(a) 27.8% (b) 72.2%

(c) 62.2% (d) 37.8%

31. In the given circuit the diode D_1 is a general purpose diode having knee voltage is 0.6 volt and D_2 is an LED having knee voltage is 1.4

volt, Determine the states of diodes



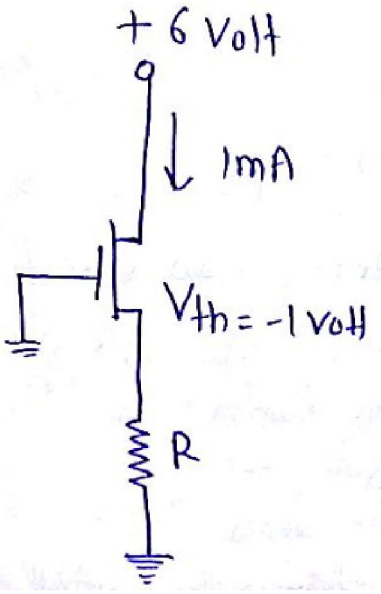
(a) D_1 is ON, D_2 is off

(b) D_1 is off, D_2 is ON

(c) Both D_1 and D_2 are ON

(d) Both D_1 and D_2 are off

32. The value of R so that the given PMOS is in saturation region with a current of 1 mA



(a) 1325Ω (b) 1225Ω

(c) 925Ω (d) 1425Ω