2023 . 2022 أمتحان إلكترونية

Choose:- 1) 1.2 2) 0.7 3) higher 4) dark
5) forward 6) low 7) Positive 8) micro or nano
9) reverse 10) n-region 11) (c)

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Ques"2" :- $N_D = 5*10^{16} cm^{-3}$ $r = 0.02$ inch $N_A = 4*10^{18} cm^{-3}$

$n_i = 1.5*10^{10} cm^{-3}$ $q = 1.6*10^{-19}$ $V_t = 25 mV$

$$V_o = V_t \ln \frac{N_A N_D}{n_i^2} = 25 * \ln \frac{(4*10^{18})(5*10^{16})}{(1.5*10^{10})^2} = 860.5 mV$$

$$\varepsilon_s = \varepsilon_o \varepsilon_r = (8.85*10^{-14})(11.8) = 1.0443*10^{-12}$$

$$W = \sqrt{\frac{2\varepsilon_o V_o}{q}\left(\frac{1}{N_A}+\frac{1}{N_D}\right)^2} = \sqrt{\frac{(1.04*10^{-12})*860.5*2}{(1.6*10^{-19})}\left(\frac{1}{4*10^{18}}+\frac{1}{5*10^{16}}\right)^2}$$

$$= 4.57*10^{-4}$$

$$x_{no} = \frac{W N_A}{N_A+N_D} = \frac{(4.57*10^{-4})\,4*10^{18}}{(4*10^{18})+(5*10^{16})} = 4.51*10^{-4}$$

$$x_{po} = \frac{W N_D}{N_A+N_D} = 5.641*10^{-6}$$

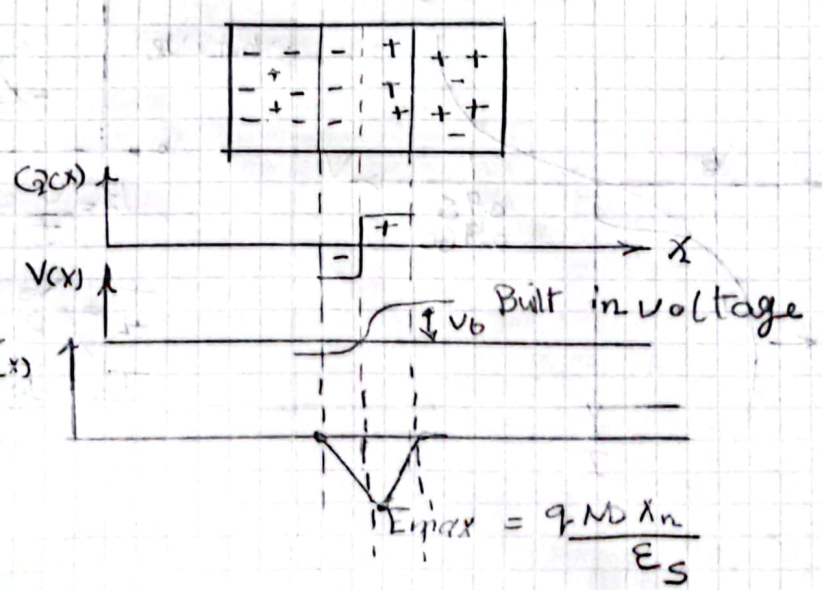
$A = \pi r^2$ $r = 0.25$

$$Q' = q x_{no} N_D A = (1.6*10^{-19})(4.51*10^{-4})(5*10^{16})(\pi(0.25)^2)$$

$$= 706*10^{-7}$$

$$E_{max} = q\frac{N_D x_n}{\varepsilon_s} = \frac{1.6*10^{-19}*(5*10^{16})*(4.51*10^{-4})}{1.0443*10^{-12}}$$

$$= 3.44*10^{6}$$



| | led | Photo |
|---|---|---|
| Function | It convert elec to light | It convert light to elec |
| Symbol |  |  |
| Bais | Forward | Reverse |
| Application | - T.V<br>- Traffic Signals<br>- coulard display | - remote control<br>- Smoke detector<br>- mideal diveses<br>- Solar cell |

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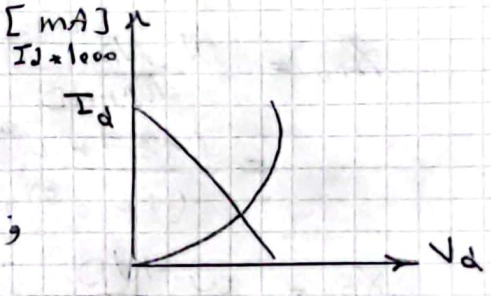
Ques 3:-

```
clc; clear all; close all;
Isat = 4.*10^-5 A;
Vd = [0:0.001:4];
R = 20Ω, V = 1;
Id = Isat*exp(Vd/(1.85*(26.25))-1);
iR = -Vd/R + Vs/R;
```




Figure

```
Plot(Vd, Id*1000,'b', Vd, iR*1000,'r');
xLable('Diode voltag Vd')
yLable('Diode current Id [mA]')
axis [0 5 0 50]
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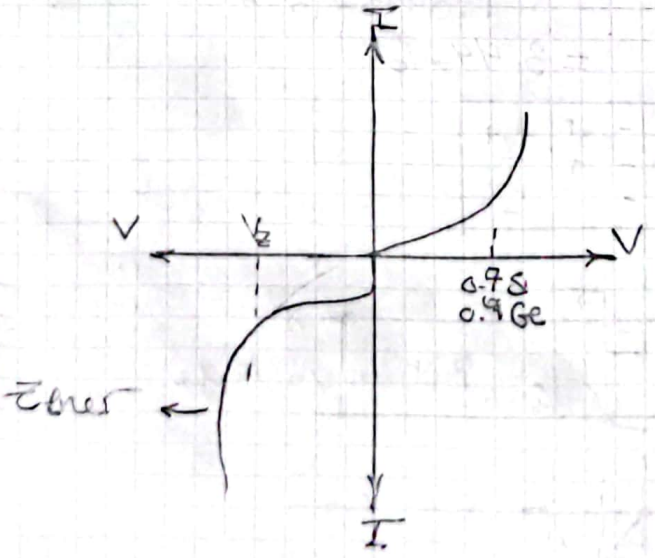
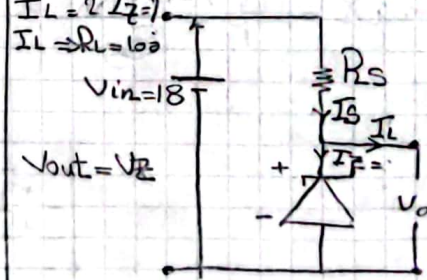
Ques 4 :-




$P_z = 2w$

$P_z = I_z U_z$

$I_z = \frac{P_z}{U_z} = \frac{2}{8} = 0.25\ A$

$R = \frac{U}{I} = \frac{V_{in} - V_z}{I} = \frac{18-8}{0.25} = 40$

$I_L = \frac{V_z}{R_L} = \frac{8}{100} = 0.08\ A$

$I_z = I_S - I_L = 0.25 - 0.08 = 0.17\ A$