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H

TEC–101

B. Tech. (First Semester)
Mid Semester EXAMINATION, 2016
(All Branches)
BASIC ELECTRONICS ENGINEERING

Time : Two Hours] [*Maximum Marks : 60*

Note : (i) This question paper contains *three* questions with alternative choice.

(ii) All questions are compulsory.

(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.

(iv) Each Part carries **ten** marks. Total marks assigned to each question are **twenty.**

1. (a) What do you mean by a logic gate ? Realize OR, AND and NOT logic gates using.

(i) NAND gates only

(ii) NOR gates only

(b) Using the laws of Boolean algebra, show that :

(i) $(A' + B)(A + B) = B$

(ii) $(A(A+B) = A$

(iii) $((AB)' + A' + AB)' = 0$

Or

(c) Write short notes on the following :

(i) Base of a number system

(ii) Postulates of Boolean algebra

(iii) EX-NOR gate

(d) Perform the following operations :

(i) $(23)_{10} - (30)_{10}$ in binary using 1's complement

(ii) $(15)_{10} - (10)_{10}$ in binary using 2's complement

(iii) $(89)_{10} + (67)_{10}$ using BCD addition

2. (a) Differentiate between insulators, metals and semiconductors with examples. What do you mean by an extrinsic semiconductor ?

(b) Perform the following number system conversions :

(i) $(65)_8 = (?)_{16}$

(ii) $(AC.7D)_{16} = (?)_{10}$

(iii) $(35.2)_{10} = (?)_2$

(iv) $(85)_{10} = (?)_8$

(v) $(11100.11)_2 = (?)_{10}$

Or

(c) Explain the drift current density and diffusion current density for semiconductors with relevant mathematical expressions and necessary diagrams.

(d) A pure Ge semiconductor with 4.42×10^{22} atoms/cm^3 is doped with donor impurity to the extent of 1 impurity atom in 10^8 Ge atoms. Find the conductivity due to majority and minority charge carriers. Given that intrinsic carrier concentration n_i is 2.5×10^{13} /cm^3, mobility of electrons is 3800 cm^2/V-s and mobility of holes is 1800 cm^2/V-s.

3. (a) Discuss the formation of the depletion layer and barrier potential in P-N junction diode. Also explain the effect of temperature on characteristics of diode.

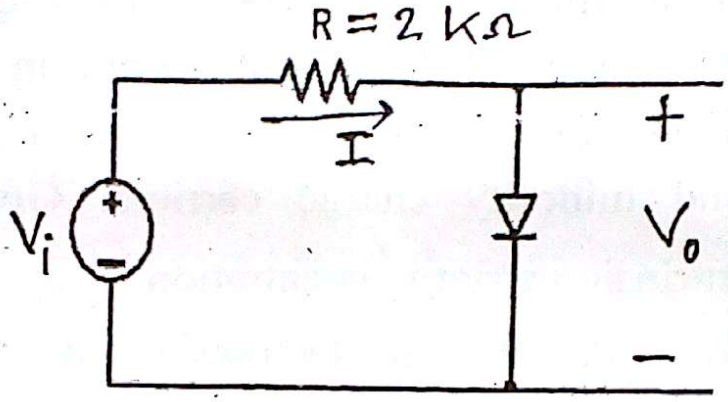
(b) (i) The forward current through a Silicon diode is 10 mA at room temperature (27°C). The corresponding forward voltage is 0.75 Volt. Calculate the reverse saturation current I_0.

(ii) Find the dynamic resistance for a Germanium diode having a forward bias of 200 mV and reserve saturation current of 1 μA at room temperature.

Or

(c) Discuss ON/OFF operation of P-N junction diode. What do you mean by 'reverse recovery time' ?

(d) In the following circuit, determine the value of current I and voltage V_0.



If (i) $V_i = 5$ V and diode is ideal.

(ii) $V_i = 5$ V and the diode is of Silicon. Given Si (ON) = 0.7 V

(iii) $V_i = 0.1$ V and the diode is of Silicon.

(iv) Diode is ideal and input voltage source $V_i = 5$ V is connected with reversed polarity.