Reg. No. : | | | | | | | | | | | |

C 3235

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Third Semester

(Regulation 2004)

Electronics and Communication Engineering

EC 1202 — ELECTRON DEVICES

(Common to B.E. (Part-Time) Second Semester Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. In a CRT, 3×10^{17} electrons are accelerated through a potential difference of 10,000 V over a distance of 40 mm per minute. Calculate the average power supplied to the beam of electron.

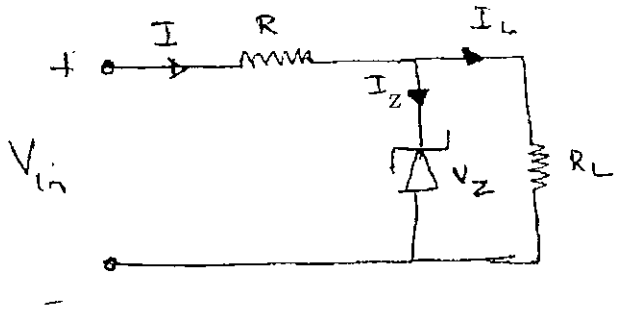
2. Explain the terms in the expression for intrinsic concentration.

3. A certain PN junction diode has a leakage current of 10^{-14} A at room temperature 27°C and 10^{-19} A at 125°C. The diode is forward biased with a constant current source of 1 mA at room temperature. If current is assumed to remain constant calculate the junction barrier voltage at room temperature and at 125°C.

4. Draw the ideal characteristics and equivalent circuit model for a ideal diode.

5. Define negative resistance for a tunnel diode.

6. Calculate the voltage regulation of the circuit shown below, if



[I_L varies 10 mA → 120 mA]

the zener diode has the following ratings :

V_Z, I_Z = 6.8 V, 50 mA

$r_Z = 2\Omega$, $I_{Zmin} = 5mA$, $I_{Zmax} = 150mA$.

7. Draw the transistor circuit in CE configuration, indicating the correct biasing.

8. Draw the transfer characteristic of a N-channel JFET.

9. List out the applications of UJT.

10. Draw the symbol and equivalent circuit of a TRIAC.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the differences between electrostatic focusing and magnetic focusing in a CRT system. (8)

(ii) The accelerating voltage of a CRT is 2000 V. A sinusoidal voltage is applied to a set of deflecting plates. The axial length of the plates is 2 cm. What is the maximum frequency of this voltage if the electrons are not to remain in the region between the plates for more than one-half cycle? For what fraction of a cycle does the electron remain in the region between the plates if the frequency in 60 Hz? (8)

Or

(b) (i) Derive the expressions for conductivity of N type and P type semiconductor.

(ii) What length of a round copper wire of diameter 1 mm will have a resistance of 1 kΩ if copper conductivity is 60 MS/m? A cylindrical piece of silicon having a diameter of 1 mm is doped with $10^{20}/m^3$ atoms of phosphorous which are fully ionised. What length of this silicon would be required to give a resistance of 1 kΩ if electronic mobility in silicon is 0.1 m^2/VS.

12. (a) Draw and explain the various current components in a PN junction diode. How are the current components calculated?

Or

(b) (i) Explain the effect of temperature on the volt ampere characteristics of a PN diode. (8)

(ii) For what voltage will the reverse saturation current in a PN junction Ge diode reach 90% of its saturation point at room temperature? (8)

13. (a) (i) Explain the differences between transition capacitance and diffusion capacitance. (8)

(ii) Calculate the barrier capacitance of a Ge PN junction whose area is 1×1 mm and space charge thickness in 2×10^{-4} cm. The dielectric constant of Ge is 16 with respect to free space. (8)

Or

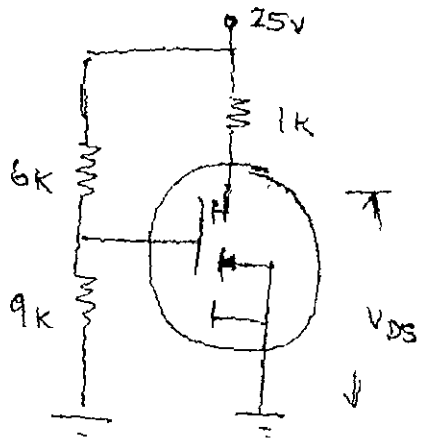
(b) Explain the construction and application of LED.

14. (a) What are the different operating modes of a transistor? Specify the method to test if a transistor is in the active region or saturation region.

Or

(b) (i) Derive the static characteristics of a JFET indicating the drain characteristics for various settings of gate source voltage. (8)

(ii) Find V_{GS} and V_{DS} for the Enhancement MOSFET shown in the figure below if $I_{D(ON)}$ = 4 mA, V_{gs} = 10 V and $V_{gs(th)}$ = 5 V. (8)



15. (a) Explain the different types of breakdown devices. Discuss on their applications.

Or

(b) Describe the constructional details of a Schottky diode with its circuit symbol and equivalent circuit. How does the characteristic differ from an ordinary PN junction diode?

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