**(1126)**

# B.A./B.SC. (General) Vth Semester (0005) Examination

# 0449

## PHYSICS

## (Electronics and Solid State Devices-I)

## Paper : B

Time : 3 Hours]                                      [Maximum Marks : 65

***Note :-***   Attempt any two question each from Section-A and Section-B. Section-C is compulsory. The use of non-programmable calculator is allowed.

## Section-A

1.   (a)   What is a cathode ray oscilloscope (CRO)? Write down its principle, working and uses in detail.                                                                6

     (b)   Mention equivalence between the current and voltage sources. How current source can be converted into voltage source?                          3

2. (a) Obtain an expression for the depletion width of p-n junction diode ? What happens to the width layer when the diode is forward or reverse biased ?  6

(b) Calculate the static and dynamic resistance of a Ge diode at room temperature (25°C). Given reverse saturation current $(I_s) = 1$   A and bias voltage $(V) = 0.5$ V.  3

3. (a) Show that at absolute zero temperature Fermi level of a semiconductor lies exactly at middle of the top of valence band and bottom of the conduction band. What happens to Fermi level when the temperature increases ?  6

(b) A minimum current. of 3.2 mA passes through a Zener's diode having rating 14 V and 0.25 W.  Then calculate the value of series resistance if it is connected with 12 V supple power supply.  3

### Section-B

4. (a) What is a Rectifier? Draw the circuit diagram and explain working of full wave rectifier with.  $\pi$-section filter. Also derive expression for the ripple factor.  6

(b) Draw the input and output waveform through unbiased and biased series positive clippers.  3

5. (a) Define load line and quiescent Point of a transistor amplifier. How will you draw load Lineon the outputcharacteristics of a transistor and what is its importance ?                                       6

   (b) In a common base Circuit. $\alpha = 0.96$. If the base current is 60 µA, then calculate (i) emitter and (ii) collector current through transistor.       3

6. (a) Draw a neat diagram of common emitter transistor amplifier and its a.c. equivalent circuit. Obtain theexpression for current gain, voltage gain, power gain, input resistance and Output resistance in term of $h$-parameters for this configuration.                                       7

   (b) Define, early effect, in the input characteristic of common base transistor.       2

## Section-C

7. Attempt any *eight* parts:

   (i) Why the resistance of p-n junction diode decreases when it is forward biased ?

   (ii) Define knee voltage. What is the value of keen voltage for Si and Ge diode ?

(iii)  Tell why the base region of a transistor is very thin as compare to emitter and collector region ?

(iv)  What are photo diodes ?

(v)  Differentiate between ordinary and light emitting diode.

(vi)  Why Zener breakdown voltage decrease with increase in temperature ?

(vii)  Define ripple factor of rectifier.

(viii) Why do we prefer to use transistor amplifier in CE mode?

(ix)  A bipolar junction transistor has $I_B = 400 \ \mu A$, $\beta = 99$, $I_{CO} = 2 \ \mu A$. Calculate its collector current.

(x)  Define peak inverse voltage and leakage current.
$$1 \times 8 = 8$$