(b) Given $I_{DS}$ = 6mA and $V_p$ = -6 V for a n-channel JFET in the circuit shown in Figure Q3b. Determine $V_{DSQ}$, $I_{DSQ}$, $V_D$ and $V_S$.

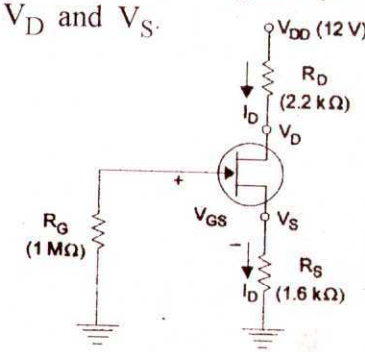



Fig. Q3 b.

(c) Discuss potential divider biasing of BJTs and explain the advantages of biasing. How does the Self biasing differ from potential divider biasing ?

5 Attempt any two : **10×2=20**

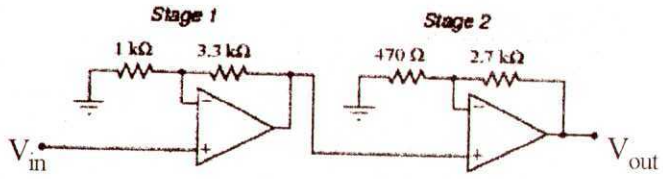
(a) Write short notes on

(i) Positive clamper and clamp the square wave form at 5 V with suitable circuit diagram

(ii) Bridge Rectifier and derive the expression for ripple factor.

(b) What are the different logic gates ? Obtain NOR gate using NAND gates only. Convert 123.456 decimal number into binary and hexa decimal code.,

(c) Determine the voltage gain at each stage of following OPAMP circuit and than find out overall voltage gain of the same.






PAPER ID : 3033

TEC-101 **Printed Pages : 4**

Paper ID and Roll No. to be filled in your Answer Book

Roll No.

**B. Tech.**

(SEM. I) (ODD SEM) (REG. & BACK) EXAMINATION, 2012-13

**FUNDAMENTALS OF ELECTRONICS ENGINEERING**

Time : **3** Hours] [Total Marks : **100**

1 Attempt any four : **5×4=20**

(a) The intrinsic resistivity of germanium at 300 K is 0.60 Ω m, find its intrinsic carrier concentration. The free electron and hole mobilities are 0.38 and 0.18 $m^2/Vs$ at 300 K respectively and charge of an electron is $1.6 \times 10^{-19}$ C.

(b) In a semiconductor material the silicon sample is doped with boron to a density of $4 \times 10^{20}/m^3$ as well as with phosphorous to a density of $10^{20}/m^3$. The electron mobility in Si is 0.15 $m^2/Vs$. What will be the conductivity of Si sample ?

(c) Determine the conductivity and resistivity of intrinsic sample of Si at room temperature 300 K. Given

$\mu_n$ = 1800 $cm^2/Vs$

$\mu_p$ = 570 $cm^2/Vs$

$n_i$ = $2.5 \times 10^{10}/cm^3$ at 300 K

$q$ = $1.6 \times 10^{-19}$ C

(d) How holes are created in semiconductor materials ? Explain the movement of hole in semiconductor material with suitable diagram.

(e) When phosphorus impurity is added to intrinsic semiconductor material, explain what type of semiconductor material will result and justify your answer with proper reasoning.

(f) Why the Fermi level used to shift in extrinsic semiconductor material ? Explain what will happen if we keep on adding boron impurities in pure semiconductor material.

2 Attempt any four : **5×4=20**

(a) Explain the formation of space charge region in the vicinity of pn junction and define barrier potential height.

(b) Find out the diffusion capacitance in *p-n* junction diode at room temperature, if mean life-time of carrier is $10^{-7}$ s, $\eta$=1 for Ge diode. Assume the diode is operated at room temperature and forward current is 20 mA. At room temperature the developed voltage is 26 mV.

(c) For a semiconductor diode, define static and dynamic resistance.

(d) Show that the maximum theoretical TUF, which can be achieved with a full-wave rectifier, is 81.06%.

(e) How ripple factor in rectifiers is rectified ? Explain the choke input or L section filter.

(f) Breakdown diode with a breakdown voltage greater than 5 V generally have a positive temperature coefficient but those with lower breakdown voltage have a negative temperature coefficient. Do you agree with the statement ? Justify.

3 Attempt any two : **10×2=20**

(a) For the amplifier shown in figure Q3 a, find :

(i) Current gain



(ii) Input resistance

(iii) Voltage gain, $A_{vs}$

(iv) Output resistance $R_o$

for the transistor, assume $h_{fb}$ = -0.99 $h_{ib}$ = 25 Ω, $h_{rb}$ = 0, $h_{ob}$ = 0.

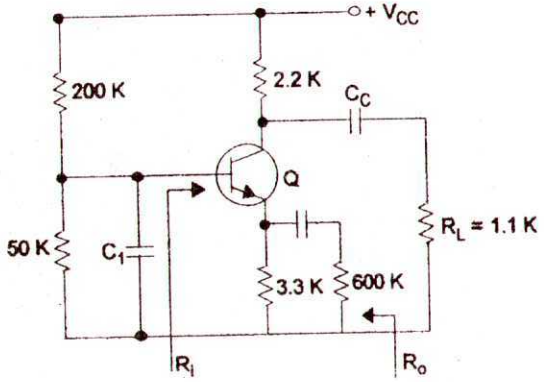



**Fig. Q3 a.**

(b) Draw and describe h-parameter equivalent circuit for a common collector transistor amplifier. Show how the value of $h_{ic}$, $h_{rc}$, $h_{fc}$ and $h_{oc}$ are obtained from the common collector input characteritics curve and CC output characteristics curves.

(c) Define the active, saturation and cut-off regions in a transistor. Sketch a family of CC output characteristics for a transistor. Indicate the active, cut-off and saturation regions.

4 Attempt any two : **10×2=20**

(a) Explain the basic construction of a enhancement and depletion type MOSFET. Also discuss the working principle of typen-channel depletion type MOSFET. Draw and explain its characteristics.