Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-III Remedial Examination March 2010

Subject code: 131101

Subject Name: Basic Electronics

Date: 09 / 03 / 2010 **Time: 3.00 pm – 05.30 pm**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(A)** What is transition capacitance of a p- n junction diode ? For a step graded junction prove that the expression for the transition capacitance of a diode is same as the capacitance of a parallel plate capacitor. **07**

(B) How does the designer minimize the percentage variation in I_C , due to variation in I_{CO} and V_{BE} and due to variation in β in transistor amplifier circuit. **07**

Q.2 **(A)** A 230 V , 50 Hz AC voltage is applied to the primary of a 5:1 step down transformer which is used in a bridge rectifier having a load resistor of a value 470 Ω. Assuming the diodes to be ideal , determine the following **07**

(a) DC output voltage
(b) DC power deliver to the load
(c) Maximum value of output current
(d) Average value of output current
(e) RMS value of output current
(f) Output frequency
(g) PIV of diode

(B) Define **07**

(a) Drift velocity of electron
(b) Electric field
(c) Photovoltaic potential
(d) Photo excitation
(e) Photo ionization
(f) Intensity of electric field
(g) Reverse recovery time of diode

OR

(B) Define **07**

(a) Electron volt
(b) Potential
(c) Critical wavelength for semiconductor
(d) Mean life time of carrier
(e) Mobility of electron
(f) Volt equivalent of temperature
(g) Pinch off voltage of FET

Q.3 **(A)** A bar of silicon 0.2 cm long has a cross sectional area of 9×10^{-8} m^2 , heavily doped with phosphorus. What will be the majority carrier density resulting from doping if the bar is to have resistance of 2 kΩ ? Given for silicon at room temperature : **04**

$\mu_n = 0.14$ m^2/V-sec, $\mu_p = 0.05$ m^2/V-sec, $n_i = 1.5 \times 10^{10}$ /cm^3, $q = 1.602 \times 10^{-19}$ C

(B) Give minimum four comparisons of following semiconductor devices **06**

(1) Tunnel diode with conventional diode.
(2) LED with conventional diode.
(3) LED with photo diode.

(C) Prove that current density is proportional to product of charge density , mobility of charge and electric field intensity. **04**

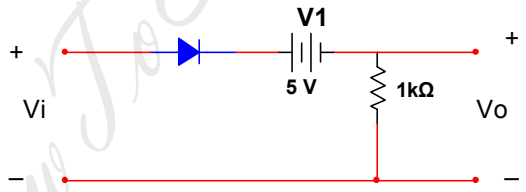
OR

Q.3 **(A)** A static resistance of 4 Ω is observed in an ideal germanium diode at room temperature. The current flowing through the diode is 50mA. If the forward biased voltage is 0.2V , volt equivalent temperature is 26mV , calculate : **04**

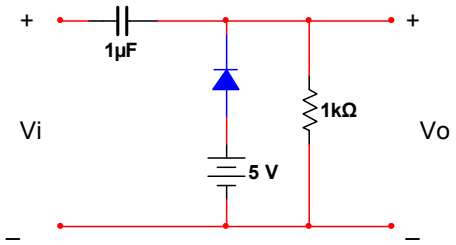
(i) Reverse saturation current
(ii) Dynamic resistance of diode

(B) Draw output waveform of following circuits. Consider input of 20V (peak to peak), 10kHz sine wave and assume ideal diode. **06**

(i)



(ii)

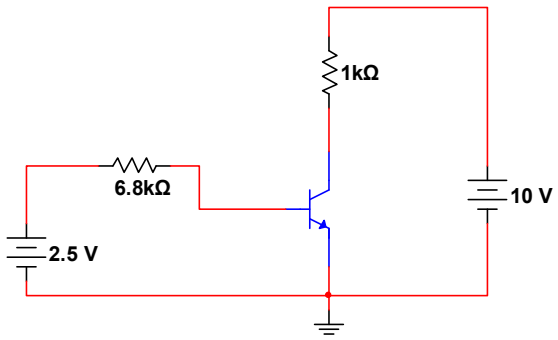


(C) Explain the hall effect in semiconductor. How hall effect is considered in measurement of mobility and conductivity? **04**

Q.4 **(A)** Derive relationship between α_{dc} and β_{dc} of a transistor. **04**

(B) Explain any one circuit which is used to improve the input impedance of the amplifier. **06**

(C) Determine whether or not the transistor in below circuit is in saturation. Assume β =50 and $V_{CE(sat)}$ =0.3V, V_{BE} =0.7V. **04**

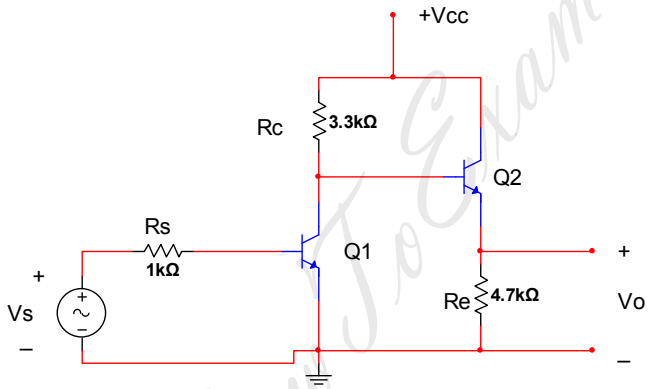


OR

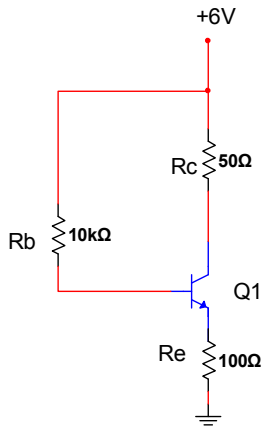
Q.4 **(A)** Compare various transistor amplifier configurations. **04**

(B) Draw and explain the input and output characteristics of p-n-p silicon transistor in CB configuration. Indicate cut off , saturation and active regions. **06**

(C) Two stage amplifier circuit is mentioned below. Calculate overall voltage gain A_v. Take h_{ie} = 2.2K ,h_{fe} = 60 , h_{re}= 2.5 × 10^{-4} ,h_{oe}= 2.5 µA/V, Rc= 3.3 kΩ , Re= 4.7kΩ, Rs= 1 kΩ, Vcc=+12V. **04**



Q.5 **(A)** For following circuit , calculate the minimum and maximum value of emitter current when β of transistor varies from 75 to 150 . Also calculate the corresponding values of collector to emitter voltage. Take V_{BE} = 0.3V, Rb= 10kΩ , Rc= 50 Ω , Re= 100 Ω, Vcc= +6V. **06**



(B) Explain with neat circuit diagram, the working of a transformer coupled class A power amplifier. **04**

(C) Compare FET with BJT in terms of advantages, disadvantages, construction and operation. **04**

OR

Q.5 **(A)** Describe briefly the construction and working of p channel enhancement MOSFET. Draw its characteristic and transfer curve. **06**

(B) A class B push pull amplifier supplies power to a resistive load of 15Ω. The output transformer has a turns ratio of 5:1 and efficiency of 78 %. **06**
Assume h_{fe} =25 and Vcc =18V.
Obtain :

(a) Maximum power output

(b) Maximum power dissipation in each transistor

(c) Maximum base current for each transistor.

(C) Explain the signification of following parameters in evaluating the regulation performance of a DC series regulator **02**

(a) Input regulation factor (Stability factor) S_V

(b) Temperature stability factor (Temperature co efficient) S_T

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