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Total Number of Pages : 02

B.Tech  
RBL1B002

1<sup>st</sup> Semester Regular/Back Examination 2019-20

**BASIC ELECTRONICS ENGINEERING**

BRANCH : AEIE, AERO, AG, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, CST, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, PT, TEXTILE

Max Marks : 100

Time : 3 Hours

Q.CODE : HRB713

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

**Part-I**

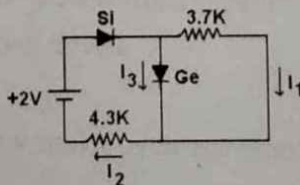
Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- Determine the dc resistance of a diode at  $V_D = -20V$  if its reverse saturation current is  $1\mu A$  (The  $V_T = 25\text{ mV}$  at room temperature)
- Give at least two examples of semiconductor materials which are used for LED.
- Why BJT is called current controlled device?
- Why collector is made larger than emitter and base?
- Take a typical open loop differential configuration and derive the output for the mentioned two inputs.
- What is the main constructional difference between D-type and E-type MOSFET?
- The reverse gate voltage of JFET when changes from 4.4V to 4.2V, the drain current changes from 2.2 mA to 2.6 mA. Find out the value of transconductance of the transistor.
- What is positive and negative logic?
- State the two Demorgan's theorem.
- What is virtual Ground?

**Part-II**

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Derive the relation between trans-conductance ( $g_m$ ) and Drain current  $I_D$  and plot the curve between them.
- Develop the basic Diode equation. Using the same find the percentage increase in reverse saturation current of a PN junction diode if the temperature is increased from  $25^\circ C$  to  $50^\circ C$ .
- A diode is operated at room temperature with  $I_S = 10^{-10}\text{ A}$  and  $\eta = 2$ . i) What is the diode current  $I_D$ , if the voltage across the diode is  $V_D = 0.65\text{ V}$ ? ii) What voltage  $V_D$  is required for a diode current of  $200\mu A$ .
- Compare the Si diode and Ge diode?
- Determine  $I_1$ ,  $I_2$  and  $I_3$  for the circuit shown in the following figure.



- f) What is pinch off voltage in JFET? Define pinch off voltage with respect to different characteristics of an n-channel JFET. Is the drain current affected by  $V_P$ ? Justify your answer.
- g) Explain the basic operation of a full adder using Truth table. Implement the full adder using half adder.
- h)  $Y = \overline{A}B + C$ , Implement it using NOR gates only.?
- i) Derive the gain equation with feedback by taking an inverting opamp closed loop configuration.
- j) Prove that  $\overline{AB} + BC + CA = \overline{A} \overline{B} + \overline{B} \overline{C} + \overline{A} \overline{C}$
- k) Explain with neat sketch, how transistor can be used as a switch?
- l) Explain the construction and operation of a CMOS Inverter.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** A silicon diode having  $20 \Omega$  internal resistance is used as half wave rectifier. If the applied input voltage is  $50 \sin 100\pi t$  and load resistance is  $800 \Omega$ , then find (16)
- $I_m$ ,  $I_{dc}$  and  $I_{rms}$
  - Output frequency and ripple factor
  - AC input and output power
  - efficiency
- Q4** Prove that voltage divider bias is the best type of biasing than all other types of biasing. (16)
- Q5** Discuss the various ideal characteristics of opamp? Determine the output voltage of an op-amp for input voltages of  $V_{i1} = 150 \mu V$  and  $V_{i2} = 140 \mu V$ . The amplifier has a differential gain of  $A_d = 4000$  and the value of CMRR is  $10^5$  (16)
- Q6**  $F = xy'z + x'y'z + w'xy + wx'y + wxy$  (16)
- Obtain the truth table table of F.
  - Draw the logic diagram, using original Boolean expression.
  - Use Boolean algebra to simplify the function to a minimum number of literals.
  - Draw the logic diagram, from the simplified expression