H **Roll No.** ....

TEC–201

B. TECH. (SECOND SEMESTER) END SEMESTER EXAMINATION, 2018

(All Branches)

BASIC ELECTRONICS ENGINEERING

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) Each part carries **ten** marks. Total marks assigned to each question are **twenty.**

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

   (a) (i) What are universal gates ? Realize AND, OR and EX-OR gates using NAND gates only.

   (ii) State De-Morgan's theorem. Apply De-Morgan's theorem and simplify the following :

$$Y = \overline{\overline{A + B\overline{\overline{C}}} + D\overline{\overline{(E + \overline{F})}}}$$

(b) (i) Convert the following numbers as indicated :

(1) $(4021.25)_{10} = ()_2$.

(2) $(A6F.CD)_{16} = ()_8$

(ii) Minimize the following, functions using Boolean algebra rules :

(1) $Y = AB + A(B + C) + B(B + C)$

(2) $Y = A + AB + ABC + ABCD + \ldots\ldots$

(c) (i) Perform BCD addition of $(184)_{10}$ and $(576)_{10}$.

(ii) Subtract the following :

(1) $(1011)_2 - (1100)_2 =$ .... with the help of 2's complement.

(2) $(10110)_2 - (10011)_2 =$ .... with the help of 1's complement.

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) (i) Distinguish in between intrinsic semiconductor and extrinsic semiconductor. What happens to the conductivity of a semiconductor with the rise in temperature ?

(ii) What is meant by Fermi level in a semiconductor ? Describe Fermi level in context of intrinsic and extrinsic semiconductors.

(b) (i) State and discuss mass action law.

(ii) What is the concentration of holes in silicon crystals having donor concentration of $1.4 \times 10^{24}/m^3$? Intrinsic carrier concentration is $1.4 \times 10^{18}/m^3$. Find the ratio of electron to hole concentration.

(c) (i) Define diffusion and drift currents in a semiconductor.

(ii) Free electrons and holes motilities for pure silicon and pure germanium are given as follows :

For pure germanium

$\mu_e = 3800\ cm^2/V\text{-}s$,

$\mu_h = 1800\ cm^2/V\text{-}s$

For pure silicon $\mu_e = 1300\ cm^2/V\text{-}s$,

$\mu_h = 500\ cm^2/V\text{-}s$

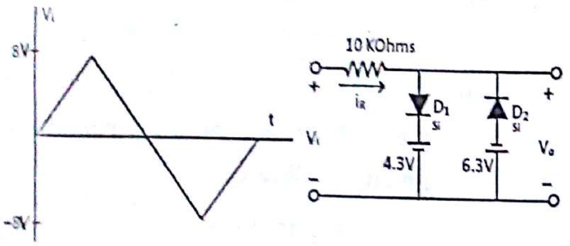
Determine the values of intrinsic conductivity for both.

Assume intrinsic concentration $n_i = 2.5 \times 10^{13} cm^{-3}$ for germanium and $n_i = 1.5 \times 10^{10} cm^{-3}$ for silicon at room temperature.

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Draw the forward and reverse characteristics of a *p-n* junction diode. State the relationship in between forward current and forward voltage. Explain Zener and Avalanche breakdown mechanisms in reverse bias diode.

(b) Sketch i_R and V_o for the circuit :



(c) Draw the circuit and discuss the working of full wave bridge rectifier using suitable input and output waveform.

4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

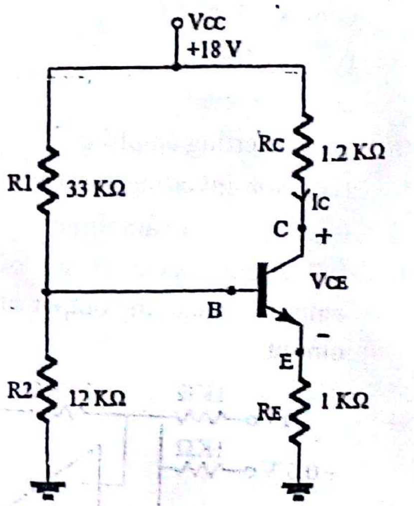
(a) Draw and explain input and output characteristics of common emitter configuration (CE) using NPN BJT. Indicate all the regions of operation.

(b) Why is transistor biasing required ? Determine the following for the BJT bias circuit shown in the figure given below. Assume Si-BJT. Given that $\beta = 80$:

(i) Type of biasing

(ii) I_C

(iii) V_{CE}



(c) Differentiate in between unipolar and bipolar semiconductor devices by giving *two* examples of each. Draw the structure of JFET and explain its principle of operation.

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

   (a) Describe the concept of virtual ground in op-amp. circuits. Draw the circuit diagram of an integrator using op-amp. and explain its working.

   (b) Write short notes on the following in context of op-amps. :

   (i) CMRR

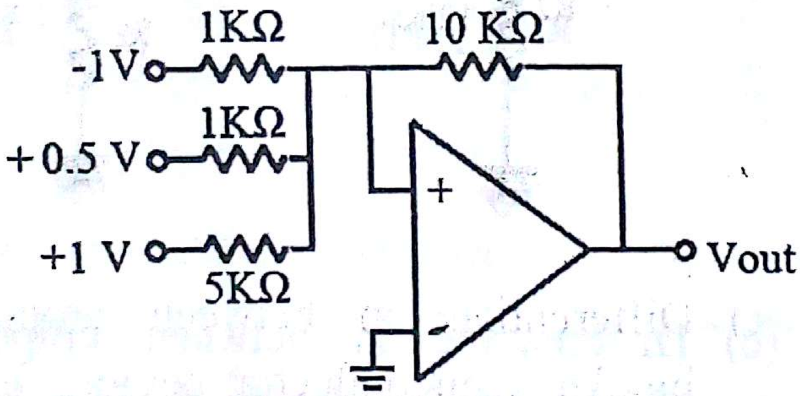
   (ii) Slew rate

   (iii) Inverting amplifier

   (iv) Non-inverting amplifier

   (v) Unity gain amplifier

   (c) Enlist the characteristics of an ideal op-amp. Calculate the output of the following circuit :



F. No. : a-80