Roll No. | | | | | | | |

Paper Code: TEC-101/201

B.Tech. (First Semester)
Back Paper Examination, 2017
BASIC ELECTRONICS ENGINEERING

Time:Three Hours

MM:100

Note:

I) This question paper contains five questions.
II) All questions are compulsory
III) Each question carries three parts a, b and c. Attempt any two parts of your choice in each question.
IV) Each part carries ten marks. Total marks assigned to each question are twenty.

1. (a) Perform following arithmetic operations:

(i) Convert $(ECE)_{16}$ to its equivalent binary number.

(ii) $(1110011)_2 - (0100101)_2$ using 2's complement.

(b) Perform following Boolean operations:

(i) State the De-morgan principle with expression.

(ii) Draw logic gate diagram of the *simplified* Boolean expression of $\overline{\overline{(A \cdot \bar{B})} \cdot \overline{(\bar{A} \cdot B)}}$

(c) (i) Realize the following with basic logic gates: ABCD+BCD+ACD+ABD.

(ii) Realize the Ex-Or gate using NOR gate.

2. (a) Explain the reasons for the following effects:

(i) An intrinsic semiconductor behaves like an insulator at 0-deg Kelvin.

(ii) Temperature co-efficient of resistance for a semiconductor is negative.

(b) In an extrinsic semiconductor, concentrations of the holes and the electrons are $4{\cdot}52 \times 10^{24}/m^3$ and $1{\cdot}25 \times 10^{14}/m^3$, respectively. If the mobility of an electron is $0{\cdot}38 m^2/Vs$ and that of a hole is $0{\cdot}18 m^2/Vs$, then determine the following:

(i) *What type* of extrinsic semiconductor (*p*-type or *n*-type) is this material and *why*?

(ii) Carrier concentration in an undoped (*i.e.*, pure) specimen of this semiconductor,

(iii) Conductivity of the intrinsic semiconductor, and

(iv) Conductivity of the doped semiconductor.

(c) Explain Avalanche breakdown. State *two* of its differences with the Zener breakdown mechanisms.

3. (a) Explain the effect of change in temperature on the I-V characteristics of a diode with the help of a neat diagram.

(b) Draw the circuit of a full-wave bridge rectifier circuit and derive following parameters:

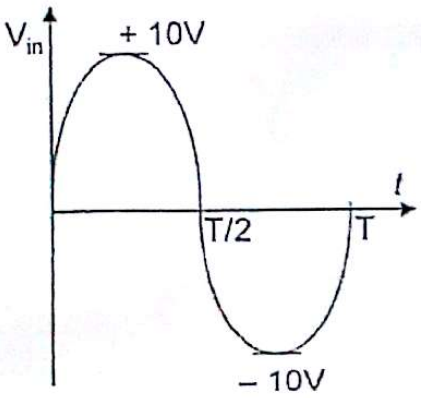
(i) Average Current,

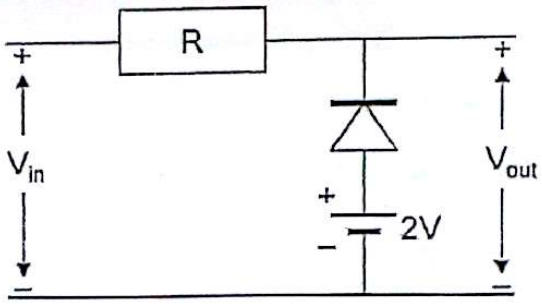
(ii) R. M. S. Current, and

(iii) Ripple Factor.

(c) Draw the circuit of a common emitter (CE) configuration using NPN transistor. Draw its output characteristics, clearly indicating the active, the saturation and the cut-off regions.

4. (a) Name the below-mentioned circuit. Assuming diode to be ideal, draw waveform of its output voltage, V_{out}, for the given sinusoidal input:

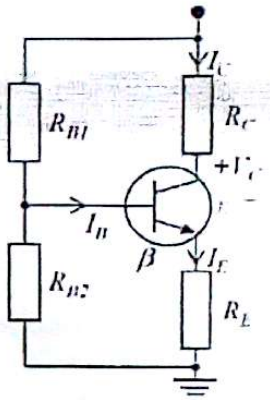




(b) Explain the following in detail.

(i) Explain the working principle of an LED

(ii) Working of integrator using IC-741.



(c) Various parameters in a CE silicon transistor (V_{BE} = 0.7V) amplifier are given as follows: V_{CC} = 22V, R_{B1} = 39kΩ, R_{B2} = 3·9kΩ, R_C = 10kΩ, R_E = 1·5 kΩ and β = 140. Answer the following for the adjacent circuit:

i. Name the type of biasing configuration used in the circuit,

ii. Determine the collector current, I_C, and

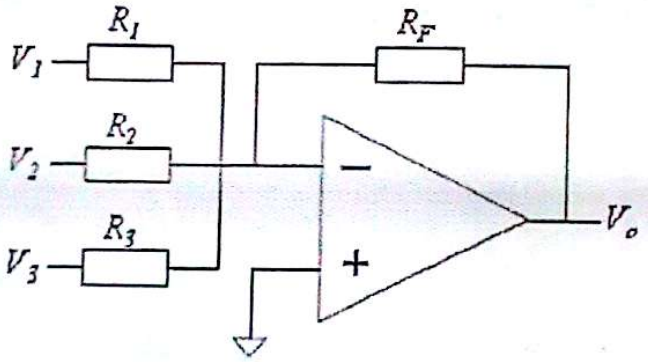
iii. Determine the collector-emitter voltage, V_{CE}.

5. (a) Draw circuit diagrams and derive their input-output relations to show how an OPAMP works as:

(i) Inverting Amplifier, and

(ii) Differentiator.

(b) Calculate the output voltage of an OPAMP based *adder* (as shown in the figure below) for the following input voltages and resistances: V_1 = 1V, V_2 = 2V, V_3 = 3V, R_1 = 500kΩ, R_2 = 1MΩ, R_3 = 1MΩ, and R_F = 1MΩ.



(c). Write short notes on any *four* of the following questions:

i. Explain the working of a diode based clamper, with its neat circuit diagram.
ii. Represent EX-NOR gate using NAND gates only.
iii. Explain working principles of the C and the Pi filters with help of their circuit diagrams.
iv. List any *four* characteristics of an ideal OPAMP.
v. Provide any two differences between FET (Field Effect Transistor) and BJT. Also, indicate one advantage and one disadvantage of FET over BJT.