DATE: 07/12/2017
TIME: 1:30Pm to 4:30Pm

Roll No. | | | | | | | |

TEC–101

B. Tech. (First Semester)
End Semester EXAMINATION, 2017
(All Branches)

BASIC ELECTRONICS ENGINEERING

Time : Three Hours] [*Maximum Marks : 100*

Note : (i) This question paper contains two Sections.

(ii) Both Sections are compulsory.

Section—A

1. Fill in the blanks/True-False : (1×5=5 Marks)

   (a) Ripple factor for full wave rectifier is ..... .

   (b) Trivalent elements act as Donar impurities. (True/False)

   (c) $(A+B)' =$ ..... .

   (d) Grid of a CRT is kept at ..... potential. (negative/positive)

   (e) BJT is a current controlled device. (True/False)

2. Attempt any *five* parts : (3×5=15 Marks)

(a) Define Doping. Explain how *n* type semiconductor is made by doping.

(b) In a certain transistor collector current is 0.96 mA and base current is 14 μA. Determine the values of emitter current, α and β.

(c) What are the differences between Avalanche breakdown and Zener breakdown ?

(d) Define μ, r_d and g_m for a FET and obtain relation among them.

(e) Define Q-Point and stability factor.

(f) Substract $(111001.110)_2 - (100110.111)_2$ by 1's complement and 2's complement.

(g) $(6BFD)_{16} = (?)_{10} = (?)_2 = (?)_8$.

Section—B

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

(a) What do you mean by Fermi Level ? Derive the expression for the position of Fermi Level of intrinsic, N-type and P-type semiconductor.

(b) Find the conductivity of intrinsic Si at 300 K. It is given that intrinsic concentration is $1.5\times10^{10}/cm^3$ and the mobility of electrons

and holes in Si are 1300 cm^3/V-s and 500 cm^2/V-sec respectively.

(i) If donor type impurity is added to the extent of 1 impurity atom in 10^8 Si atoms then find its conductivity.

(ii) If acceptor type impurity atoms is added to the extent of 1 impurity atom in 10^8 Si atoms. Given that density of Si atom is $5\times10^{22}/cm^3$.

(c) With the help of mathematical expression, explain continuity equation for semiconductors in brief.

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

(a) Explain the different diode models in brief. A Si diode has reverse saturation current of 2.4 μA at 300 K. Find forward voltage for a forward current of 10 mA. Given that $V_T = 26$ mV.

(b) The turn ratio of a transformer used in a Bridge rectifier is 10 : 1. The primary is connected to the power mains 240 V, 50 Hz. The diode resistance is 2 Ω. The load resistance is 10 kΩ. Calculate the following parameters :

(i) DC Voltage

(ii) RMS voltage

(iii) TUF

(iv) Rectification efficiency

(v) Draw the circuit diagram.

(c) Explain Avalanche and Zener breakdown. With the help of circuit diagram, explain the working of a Zener shunt regulator.

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

(a) Explain load line stability factor in brief. Derive the expression for Q-Point and stability factor for the collector to base bias circuit.

(b) Explain construction and working of D-Type, *n*-channel MOSFET.

The following observations were taken for determining drain resistance, transconductance and amplification factor of a JFET :

V_{DS} in volts :	7	14.5	14.5
V_{GS} in volts :	0	0	– 0.3
I_D in mA :	3.25	10	9.2

Determine drain resistance, transconductance and amplification factor for the given JFET.

(c) Explain the working of C. R. O. Which figure is made on the screen of C. R. O. when :

(i) Two sinusoidal signals, 90° out of phase with equal amplitude are applied to the horizontal and vertical plates of C. R. O.

(ii) Two sinusoidal signals, 180° out of phase with equal amplitude are applied to the horizontal and vertical plates of C. R. O.

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

(a) (i) State and prove de Morgan's law.

(ii) Realize EX-NOR gate by universal gates.

(b) Solve F (A, B, C, D) = Σm (0, 1, 2, 3, 4, 5, 8, 9, 12, 13, 15) using K-Map and realize the result by NAND gate only.

(c) (i) Express F (A, B, C) = $AB' + AC + B'C'$ in canonical SOP form.

(ii) Express F (A, B, C) = $(A + B').(A + C').(B' + C)$ in canonical POS form.

(iii) $(5636)_7 = (?)_8$.

(iv) Prove that :

$$(A + B).(A + B').(A' + C) = AC.$$

(v) Add $(FBCA3)_{16}$ and $(DE5CF)_{16}$ without changing the base