BACHELOR OF FOOD TECH. & BIO-CHEM. ENGG. (FTBE) EXAMS., 2017
(Second Year, 2nd Semester Examination, 2017)
ELEMENTARY ELECTRONICS

Time: Three Hours   Full Marks:100
Answer Q. No. 1 and any FOUR questions from the rest.
(All Parts of the same question must be answered at one place only)

1. Fill in the blanks: [10 X 2]

(a) Bi is _____ type of impurity atom while In is _____ type of impurity atom for the doping process.

(b) Zener diode operates in _____ bias to behave _____ .

(c) The frequency of output waveform of a 4-diode bridge rectifier is _____ that of two diode center tapped rectifier.

(d) The r.m.s voltage applied to a half wave rectifier circuit to get an average output of 10V is _____.

(e) Clamper circuit provides _____distortion.

(f) Transistor operates as a switch in _____ and _____ region.

(g) A NOR gate must have both inputs '0' to have its output at state _____.

(h) According to Boolean Algebra, $A+A'C+C'=$_____ .

(i) $(25)_6+(34)_6=$_____ .

(j) 2's complement of $(1101.11)_2$ is _____ and 7's complement of $(47)_8$ is _____ .

2.(a) Deduce the potential variation between two points in a graded semiconductor. Hence derive law of mass action.

(b) Calculate the depletion layer, W_p in a p-type semiconductor when it is combined with an n-type semiconductor. Given $n=10^{20}$ cm^{-3}, $p=10^{22}$ m^{-3}, W_n (depletion width in n-type)=10^{-10} m.

(c) A silicon diode displays a forward voltage of 0.6V at 8mA current at a temperature of 25^0C. Estimate the reverse saturation current. What will happen to it with an 20^0C increase in temperature.(Given, Boltzmann constant, $K=1.38 \times 10^{-23}$ JK^{-1}, electronic charge $Q=1.6 \times 10^{-19}$C, Ideality factor, $\eta =0.9$).   [10+3+7]

3. (a) Write short note on (i) Fermi Level in Extrinsic Semiconductor (ii) Combinational clipper circuit.

(b) With a neat sketch draw a center tapped FWR circuit and discuss its rectifying operation. Hence derive the following. (i) Mean load current. (ii) PIV of each diode. (iii) Ripple Factor. (iv) Rectifier efficiency.   [12+8]

4. (a) Draw a series biased clipper circuit. Consider sinusoidal input voltage of V_m=12V, e.m.f. of battery = 3V and Si diode. Determine the output waveform. Also draw its transfer characteristics curve.

(b) Draw a biased clamper circuit so that capacitor gets charged during negative half of input cycle. Hence draw the output waveform for a triangular input with positive peak of 12V and negative peak of 8V. Take e.m.f. of battery as 2V.

[10+10]

5.(a) Explain avalanche break down mechanism.

(b) Determine Zener break down voltage of a Zener diode that maintains the output voltage of 12V across a variable load of 2-5KΩ. The supply voltage is 80V and I_{ZK}=5mA. Calculate the series resistance and the maximum power rating of Zener diode.

(c) Explain Thermal Runaway situation in BJT.

(d) Correlate between α and β.

[2+8+5+5]

6.(a) Draw a CE fixed bias circuit and determine its operating point.

(b) The power gain of CE transistor is 40 dB. If its current gain is 50dB, then calculate its output voltage for an input voltage of 10mV.

(c) State Barkhausen principle of oscillation.

(d) With a neat sketch, discuss the operation of phase shift oscillator circuit.

[6+4+4+6]

7.(a) Convert $(A3.E9)_{16}$ into its octal equivalent.

(b) Subtract $(76.54)_8$ from $(32.64)_8$ using 8's complement method.

(c) Draw truth table of 4 input 1 output XOR gate.

(d) Simplify the Boolean expression $\left(\overline{\overline{A.C}+B}\right)\left(\overline{\overline{A}+\overline{C}}\right)+\overline{AB}C$

[5+5+5+5]

8. (a) Convert Y(P,Q,R)= (P+Q')(Q+R') in to canonical forms.

(b) If $(23)_R \times (45)_R=(2003)_R$ determine R.

(c) Realize XOR gate using NOR gate.

(d) Write truth table of Full Adder circuit and realize it using logic diagram.

[5+5+5+5]