B.E. 1st Semester (CST/ETC/IT/MET/MIN) Final Examination, 2011

Subject: Basic Electronics (ET-1201)

Full marks: 70   Time: 3 hrs

Answer Question No.8 and any Four from the rest

1. (a) How does the free electron concentration increase over the intrinsic value in an n-type semiconductor? Will the hole concentration remain constant at the intrinsic value? If not, why?
   (b) For what voltage will the reverse current in a p-n junction Ge diode reach 90% of its saturation value at room temperature? What is the ratio of the current for a forward bias of 0.05 V to the current for the same magnitude of reverse-bias.
   (c) How does the position of Fermi level modify with the temperature? Explain in brief.

   5+6+4

2. (a) What are the factors on which intrinsic carrier concentrations of semiconductor depend?
   (b) Discuss the operation of a full wave bridge rectifier with resistive load. Discuss the role of filters
   (c) Determine the maximum and minimum values of Zener current if it is used in a voltage regulator circuit where the load resistance $R_L=5$ KΩ, Rs=10 KΩ, Zener voltage $V_Z=30$V and the unregulated supply voltage varies between 100V and 120V.

   4+6+5

3. (a) In the saturation region of BJT, what exactly saturates?
   (b) Why in BJT base region is made thinner and is most lightly doped (compared to emitter and collector)?
   (c) In a transistor CE configuration the voltage across 5KΩ load resistance is 5V, determine the collector current ,base current and emitter current if $\alpha = 0.96$.

   4+5+6

4. (a) Define thermal runway and stability factor of BJT.
   (b) What are the disadvantages of "Collector to Base Bias Scheme".
   (c) In the given circuit $I_E=$ 2 mA , $I_B = 50$ μA , $V_{BE}=$ 0.2V, $R_E=$1KΩ, R2=10 KΩ, $V_{CC}=$10V, find the value of R1?

   6+4+5
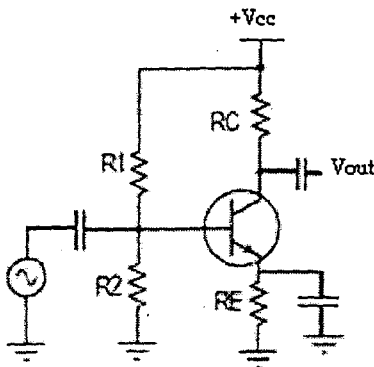
5. a) Establish the relation between α and β of BJT.
    b) Discuss the difference between positive and negative feedback
    c) Discuss the current voltage characteristics of JFET.

    4+5+6

6. (a) State and prove De-Morgan's law of Boolean algebra.
    (b) Realize a AND gate using NOR gate only.
    (c) Prove that $A + \bar{A}B = A + B$

    6+4+5

7. (a) An inverting amplifier (OP-AMP) with input voltage is 1 V , input resistance is 1KΩ,and feedback resistance 5 KΩ, find output voltage and voltage gain of the amplifier.
    (b) Discuss the operation of OPAMP based (i) Integrator (ii) Substractor (iii) Non-inverting Amplifiers.
    (c) What do you mean by "virtual grounding"?

    5+6+4

8. Answer the followings (any two)
    i) Discuss the consequences of 'Early effect'.
    ii) What are the differences between an un-doped and an equally doped semiconductor?
    iii) Can transistor action be realized by connecting two back-to-back diodes? If not, explain the reason?
    iv) Discuss the operation of positive Clipper circuit.

    5x2