Set No. 1

II B.Tech II Semester Regular Examinations, Apr/May 2007
BASIC ELECTRONICS
(Common to Mechanical Engineering and Production Engineering)
Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Explain why the energy levels of an atom become energy bands in a solid ?

   (b) Draw the circuit of full wave rectifier using center tapped transformer and explain the working of it.

   (c) Explain the need of filters in rectifier circuits.   [4+8+4]

2. (a) Sketch typical output characteristics of CE configuration of a NPN transistor. Explain how β of the transistor be computed from the above characteristics.

   (b) Draw the structure of n-channel J F E T and explain the drain characteristics of it.   [8+8]

3. (a) Name different methods of turning-on of SCR.

   (b) What are the important points to be noted while designing the gate-control circuit of SCR.

   (c) Draw and explain the V-I characteristics of SCR.   [2+6+8]

4. (a) Discuss with mathematical expressions, how the negative feedback in amplifiers reduces the distortion and increases the band width of the amplifier.

   (b) Calculate
      i. voltage gain
      ii. output impedance.
      iii. Band width of a feedback amplifier with parameters of the internal amplifier as A=250, Z_0=30 k Ω, Bandwidth = 50 kHz and having feedback factor β =0.02.   [8+8]

5. (a) What are the conditions required for an electronic circuit to oscillate.

   (b) The frequency determining network of an RC-phase shift oscillator is having R=2KΩ. Determine the value of C required for frequency of oscillation of the oscillator is to be 1.6 k Hz. Derive any formula you use.   [4+12]

6. (a) Briefly explain "Thermal Expansion timers".

   (b) Draw sequence Timer Welding Circuit and explain its operation.   [6+10]

7. (a) Explain the application of Dielectric heating for
      i. wood gluing and
      ii. pre heating of Plastic Preforms.

(b) Give the necessary block diagram and explain the working of Pulse echo ultrasonic flaw detector. [8+8]

8. (a) List various characteristics of A-to-D converter.

(b) Compare three A-to-D conversion techniques. [8+8]

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1. (a) Define mean life time of a carrier.

   (b) Draw the forward and reverse bias characteristics of a p - n junction diode and explain them qualitatively.

   (c) Compare the merits and demerits of H.W. Rectifier, Full Wave Rectifier and Bridge rectifier.   [2+8+6]

2. (a) Explain why CE configuration is commonly used in amplifier circuits.

   (b) Draw the structure of J F E T and explain in detail the effect of gate-source voltage on the channel when   [4+12]

       i. No bias

       ii. small reverse bias and

       iii. large reverse bias such that pinch-off occurs.

3. (a) Name different methods of turning-on of SCR.

   (b) What are the important points to be noted while designing the gate-control circuit of SCR.

   (c) Draw and explain the V-I characteristics of SCR.   [2+6+8]

4. (a) Explain how negative feedback improves the stability of gain of the amplifier for changes in power supply voltage or change in the parameters of the active device. What is the condition to achieve the stability of the gain.

   (b) Calculate the gain of a negative feedback amplifier with internal gain A = 500 and feed- back factor $\beta = 0.01$. If the output impedance of the internal amplifier is 80 k Ω, determine the output impedance of the feedback amplifier.
                                                                                         [8+8]

5. (a) Why phase shift through the R-C feed back network of R-C phase shift oscillator is to be 180^0? Explain.

   (b) What are the limitations of R C-Phase shift oscillators?

   (c) Draw the circuit of Colpitts Oscillator and explain the working of it. [5+3+8]

6. (a) Briefly explain "Thermal Expansion timers".

   (b) Draw sequence Timer Welding Circuit and explain its operation.   [6+10]

7. (a) Draw a neat sketch and explain the working of CR tube.

(b) Discuss about the electrodes used in dielectric heating. Explain, when the air clearance, is permitted between the Dielectric material and one or both the electrodes used in Dielectric heating. [8+8]

8. (a) What are the functional units of central processing unit in 8085. Briefly explain each of them.

(b) What is stack in 8085? What are its functions? [8+8]

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$$\boxed{\textbf{Set No. 3}}$$

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Time: 3 hours   Max Marks: 80
Answer any FIVE Questions
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1. (a) Explain what is meant by mobility of a charge carrier in a solid. Derive an expression for the conductivity of a semiconductor, containing both free electrons and holes, in terms of the concentrations n and p and the mobilities.

   (b) Draw the circuit of Bridge rectifier and explain the working of it.   [8+8]

2. (a) Sketch a family of CB input characteristics of a transistor and explain the shape of the characteristics qualitatively.

   (b) Derive the relation between α and β of a transistor.

   (c) **Define trans-conductance** &   drain resistance of J F E T. Give their units.
   [6+6+4]

3. (a) Draw two - transistor model of SCR and explain the working of SCR.

   (b) Draw the circuit symbols of SCR, DIAC and TRIAC. Give the conducting properties of the above.   [10+6]

4. (a) Distinguish between voltage feedback and current feedback in amplifiers.

   (b) Draw the block diagram of a negative feedback amplifier to show increase in input impedance and derive the expression for input impedance Z_{if} of feedback amplifier in terms of the input impedance Z_i and gain A of the amplifier without feedback and feed-back factor β.

   (c) If input impedance and gain of an amplifier without feedback are 1k Ω and 1000 respectively and feedback factor is 0.01, determine the value of input impedance of the feedback amplifier.   [4+8+4]

5. (a) Why phase shift through the R-C feed back network of R-C phase shift oscillator is to be 180^0? Explain.

   (b) What are the limitations of R C-Phase shift oscillators?

   (c) Draw the circuit of Colpitts Oscillator and explain the working of it. [5+3+8]

6. (a) Name principal types of resistance welding processes and briefly explain them.

   (b) Briefly explain the principle of working of any one type of Thermal Timers.
   [12+4]

7. (a) Draw a neat sketch and explain the working of CR tube.

   (b) Discuss about the electrodes used in dielectric heating. Explain, when the air clearance, is permitted between the Dielectric material and one or both the electrodes used in Dielectric heating.   [8+8]

8. (a) Derive an expression for an output voltage of R-2R ladder DAC.

   (b) The digital input for a 4-bit DAC is 0110. Calculate its final output voltage.

   [8+8]

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1. (a) Determine the factor by which the reverse saturation current of a semiconductor diode is multiplied when the temperature is increased from 25° to 85° C.

   (b) Explain the operation of Full Wave rectifier with resistance load. Explain the necessity of filters in rectifier circuits.   [6+10]

2. (a) Explain various current components in a PNP transistor with forward biased emitter junction and reverse biased collector junction

   (b) Draw the structure and explain the Gate and drain characteristics of n- channel J F E T   [8+8]

3. (a) Name different methods of turning-on of SCR.

   (b) What are the important points to be noted while designing the gate-control circuit of SCR.

   (c) Draw and explain the V-I characteristics of SCR.   [2+6+8]

4. (a) Explain the concept of feedback giving necessary block diagram.

   (b) Explain the effect of negative feedback in an amplifier on Distortion.

   (c) A certain amplifier has an internal gain of 80 and the harmonic distortion in the output is 12%. By applying negative feedback, the harmonic distortion is reduced to 3%. Calculate the feedback factor β in the amplifier.   [8+8]

5. (a) Classify oscillators as per

   i. operating frequencies and
   ii. output wave forms.

   (b) Derive the expression for frequency of oscillations of transistorized Hartley oscillator.

   (c) In a Hartley oscillator the two inductances used are 2 mH and 4μH. Determine the value of capacitor required for the frequency of oscillation of the oscillator is 1500 k Hz.   [4+8+4]

6. (a) Draw and explain the heat control circuit for resistance welding.

   (b) Compare and contrast the following timers: [8+8]

   i. Thermal Timers
   ii. Electro-mechanical Timers

    iii. Electronic Timers.

7. (a) Explain the application of Induction heating for
      i. Brazing and
      ii. Annealing of Brass and Bronze items.
   (b) Explain Biological applications of Ultrasonic waves.
   (c) Explain the method of measurement of voltage with C R O.

8. (a) What is the difference between A-to-D and D-to-A converters?
   (b) List 8085 registers and describe its functions.   [8+8]

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