Code No: RR12302 **Set No. 1**

I B.Tech Supplementary Examinations, November/December 2005
ELECTRICAL AND ELECTRONICS ENGINEERING
(Bio-Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Determine the effective resistance between the nodes A and B in the circuit shown in the figure 1 below (all values are in ohms).

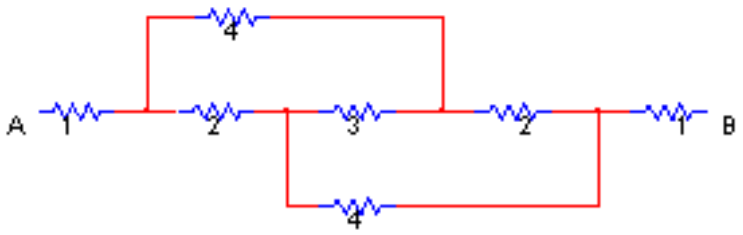


Figure 1:

(b) Find the V_c and I_L from the circuit shown in Figure 2under steady state conditions. [10+6]

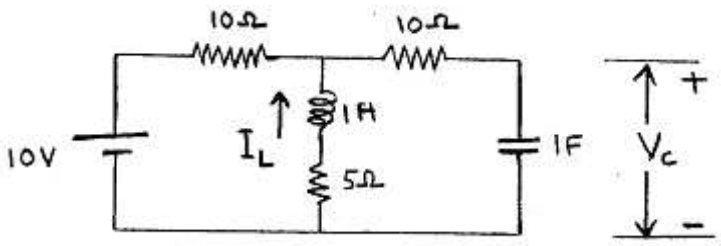


Figure 2:

2. (a) Why is the core of the transformer laminated?
   (b) What are the various losses in a transformer? And how do these losses vary?
   (c) A single phase 50HZ transformer has 100 turns on the primary and 400 turns on the secondary. The cross sectional area of the core is 250 cm^2. The primary winding is connected to 230 volts. Determine
      i. E.M.F induced in the secondary winding.
      ii. The maximum value of the flux density in the core. [4+8+4]

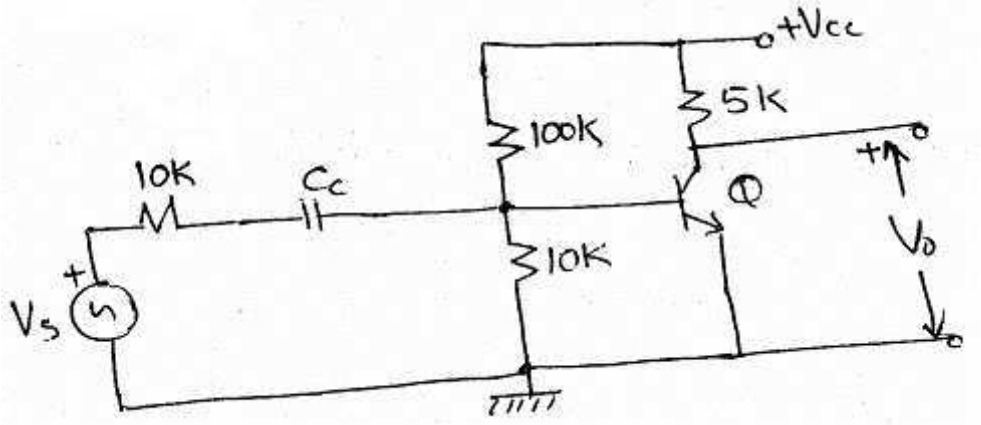
3. (a) Explain how an n-type semiconductor is formed. Name different donor impurities used.
   (b) i. Find the conductivity of intrinsic silicon at 300^0K.

ii. If donor impurity is added to the extent of 1 impurity atom in 10^8 silicon atoms, find the conductivity. It is given that at 300^0K, $n_i = 1.5 \times 10^{10}/Cm^3$, $\mu_p = 500Cm^2/v-s$, $\mu_n = 1300Cm^2/V-S$.. [4+4+8]

4. (a) Describe the basic structure of DIAC. Draw its volt-ampere characteristics and explain.
   (b) Define and explain the following terms of SCR
      i. Turn-on-time
      ii. Turn-off-time
   (c) Draw the two transistor representation of SCR and explain. [8+4+4]

5. (a) Compare and contrast of FET and BJT.
   (b) Give the constructional features of JFET and explain its operation with the help of the drain characteristics.
   (c) From the drain characteristics derive mutual characteristic and explain the shape of the curve qualitatively. [6+6+4]

6. (a) Compare the three transistor amplifier configurations with related to A_I, A_v, R_i and R_0.
   (b) For the circuit shown calculate A_I, A_V, R_i and R_0, using approximate h-parameter model. Assume $h_{fe} = 50$, $h_{ie} = 1100\Omega$, $h_{oe} = 25\ \mu A/V$, $h_{re} = 2.5 \times 10^{-4}$ as shown in the figure 3 below.



[6+10]

Figure 3:

7. (a) Explain the operation of monostable multi vibrator with relevant waveforms.
   (b) How Frequency stability can be improved in the oscillators? Explain.
   (c) For phase shift oscillator, the feedback network uses R=6kΩ and C=1500pF. The transistorized amplifier used, has a collector resistance of 18kΩ. Calculate the frequency of oscillations and minimum value of h_{fe} of the transistor. [6+4+6]

8. (a) Realize Full-adder using logic gates.
   (b) Explain the principle of operation of D-to-A converter.
   (c) Simplify the following functions
      i. A′BC′ + A′C′D + A′B′D′ + AC + BCD′
      ii. A′B′D′ + A′CD + A′BC. [4 +4+8]

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ELECTRICAL AND ELECTRONICS ENGINEERING
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. (a) Explain the principle of operation of single-phase energy meter.
   (b) A single phase energy meter is used to measure the energy consumption of factory. The factory load is 100KW and is in continuous use for 6000 hrs per annum. If the meter constant is 600 revolutions per KWhr, how many revolutions the disc of the energy meter makes. [6+10]

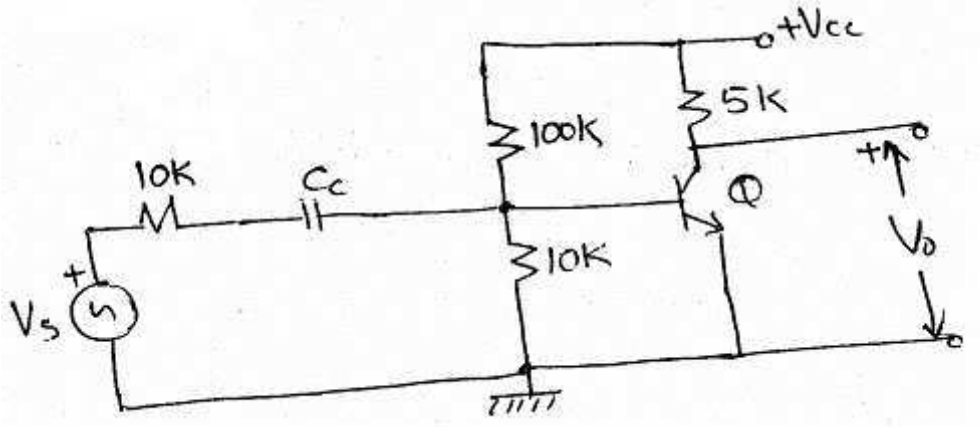
2. (a) Discuss the torque − armature current characteristics of various types of d.c motors and give the practical applications of each type of motor.
   (b) Discuss classification of d.c motors with suitable diagrams. [8+8]

3. (a) i. Find the resistivity of intrinsic silicon at 300^0K. It is given the n_i at 300^0K in silicon is $1.5 \times 10^{10}/Cm^3$ and $\mu_p = 500Cm^2/V-S$, $\mu_n = 1300Cm^2/V-S$.
      ii. If an acceptor impurity is added to the extent of 1 imputrity atom in 2×10^8 silicon atoms, find its resistivity.
      iii. If a donor impurity is added to the extent of 1 impurity atom in 5×10^7 silicon atoms, find its resistivity.
   (b) Prove that the concentration of free electron in an intrinsic semiconductor is given by $n = N_c e^{-(E_c - E_f)/KT}$ [12+4]

4. (a) Describe the basic structure of DIAC. Draw its volt-ampere characteristics and explain.
   (b) Define and explain the following terms of SCR
      i. Turn-on-time
      ii. Turn-off-time
   (c) Draw the two transistor representation of SCR and explain. [8+4+4]

5. (a) Draw a family of drain characteristics and mutual characteristics of an n-channel FET and explain the shape of the curves qualitatively.
   (b) Define FET parameters and derive the relationship between them. [8+8]

6. (a) Compare the three transistor amplifier configurations with related to A_I, A_v, R_i and R_0.
   (b) For the circuit shown calculate A_I, A_V, R_i and R_0, using approximate h-parameter model. Assume $h_{fe} = 50$, $h_{ie} = 1100\Omega$, $h_{oe} = 25\ \mu$A/V, $h_{re} = 2.5 \times 10^{-4}$ as shown in the figure 1 below.



[6+10]

Figure 1:

7. (a) Draw the circuit diagram of wien bridge oscillator using BJT. Show that the gain of the amplifier must be at least 3 for the oscillations to occur.

   (b) For the fixed-bias Ge transistor, npn type, the junction voltages at saturation and cutoff one in active region, may be assumed to zero. This circuit operate properly over the temperature range -50^{o}C to 75^{o}C and to just start malfunctioning at these extremes. The various circuit specifications are: V_{CC} = 4.5v, V_{BB} = 3^v, h_{FE}=40 at -50^{o}C, and h_{FE}=60 at 75^{o}C, I_{CBO} = 4μA at 25^{o}C and doubles every 10^{o}C. Collector current is 10μA. Design the values of R_{c1}, R_1 and R_2.. [8+8]

8. (a) Distinguish between positive and negative logic.

   (b) Represent the decimal number 8620 in binary.

   (c) How do you convert an RS flip-flop into a T-flipflop?

   (d) Distinguish between Truth table and excitation table.. [4+4+4+4]

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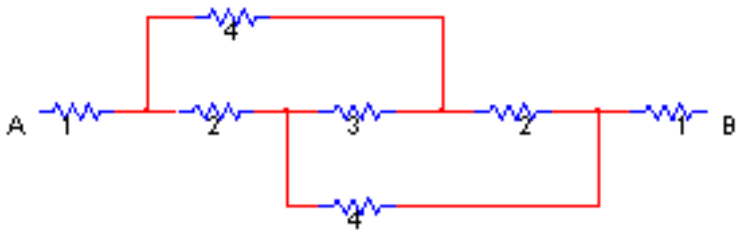

Figure 1:

(b) Find the V_c and I_L from the circuit shown in Figure 2under steady state conditions. [10+6]

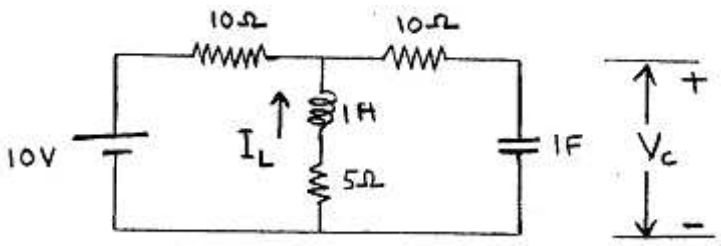

Figure 2:

2. (a) Show that single phase induction motors are not self starting.
(b) Explain the construction and working principle of any type of 1-phase induction motor. [8+8]

3. (a) Give the electronics configurations of Silicon and Germanium.
(b) What is the difference between intrinsic and extrinsic semi-conductors.
(c) Draw energy band diagrams of
   i. Insulator
   ii. Semiconductor and
   iii. Metal, and hence explain the difference in their conductivities. [4+4+8]

4. (a) The half wave rectifier shown in the figure:3 below is fed with a sinusoidal voltage v=20sin100t.
   i. Sketch the output waveform.
   ii. Determine the d.c. output voltage assuming ideal diode behaviour.
   iii. Repeat the calculations assuming the simplified diode (silicon) model.

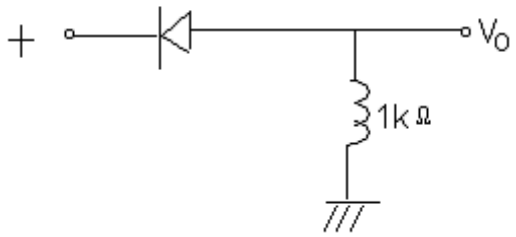

Figure 3:

   (b) Draw the circuit diagram of full wave rectifier having two diodes and explain its operation. [8+8]

5. (a) Define different stability factors of biasing circuits using BJT.
   (b) List out different transistor biasing methods and compare their merits and demerits.
   (c) Write short notes on
      i. Thermal runaway
      ii. Early effect [6+6+4]

6. (a) Draw the circuit of a transformer coupled amplifier and explain its operations.
   (b) Draw the circuit of a class B push-pull amplifier and derive expression for the output power. [8+8]

7. (a) Draw the circuit diagram of wien bridge oscillator using BJT. Show that the gain of the amplifier must be at least 3 for the oscillations to occur.
   (b) For the fixed-bias Ge transistor, npn type, the junction voltages at saturation and cutoff one in active region, may be assumed to zero. This circuit operate properly over the temperature range -50^{o}C to 75^{o}C and to just start malfunctioning at these extremes. The various circuit specifications are: V_{CC} = 4.5v, V_{BB} = 3^v, h_{FE}=40 at -50^{o}C, and h_{FE}=60 at 75^{o}C, I_{CBO} = 4μA at 25^{o}C and doubles every 10^{o}C. Collector current is 10μA. Design the values of R_{c1}, R_1 and R_2.. [8+8]

8. (a) Explain how a shift register is used as a Ring counter. Draw the O/P waveform from each flip-flop of a 3-stage unit.
   (b) Prove that if w′x + yz = 0, then wx + y′ (w′+z′) = wx + xz + x′z′ + w′y′z.
   (c) Represent the given negative numbers in sign-magnetude, 1'S and 2'S complement representation in 12-bit format.

i. -64

ii. -512..

[6+6+4]

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Code No: RR12302 **Set No. 4**

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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. (a) Derive an expression for the total power consumed in a 3-phase, delta connected load, connected to 3-phase balanced supply.
   (b) Three equal impedances of (6+J8) ohm are connected in delta fashion across 400V, 3-phase balanced supply. Calculate the phase current, line current and total power consumed by the load. [8+8]

2. (a) Discuss the classification of d.c generators with suitable diagrams, and give the practical applications of each generator.
   (b) A 10Kw shunt generator supplies load at a terminal voltage of 200 volts. The shunt field resistance is 100 ohms and armature resistance is 0.1 ohm. Calculate the e.m.f induced in the generator.. [8+8]

3. (a) Explain how an n-type semiconductor is formed. Name different donor impurities used.
   (b) i. Find the conductivity of intrinsic silicon at 300^0K.
   ii. If donor impurity is added to the extent of 1 impurity atom in 10^8 silicon atoms, find the conductivity. It is given that at 300^0K, $n_i = 1.5 \times 10^{10}/Cm^3$, $\mu_p = 500Cm^2/v-s$, $\mu_n = 1300Cm^2/V-S$.. [4+4+8]

4. (a) A sinusoidal voltage of peak value 40V and frequency 50Hz is applied to HWR using PN diode. The total load resistor is 800Ω. Neglecting cut in voltage and using idealized characteristic for the diode with R_f=8Ω and R_r=α calculate
   i. Peak d.c and RMS values of load current
   ii. d.c. and a.c. output power
   iii. Rectifier efficiency
   iv. Ripple factor.
   (b) Derive the formulas used in the above problem. [8+8]

5. (a) Sketch a family of drain and mutual characteristics and explain the shape of the curves qualitatively for a JFET.
   (b) For a source self-bias circuit if I_D = 0.8 mA, I_{DSS} = 1.65 mA and V_P = -2V find V_{GS}. [8+8]

6. (a) Define class A, B, AB, B and C operation of amplifiers.
   (b) Draw the circuit diagram of a push-pull amplifier and explain how even harmonics are eliminated.

(c) Derive the relation between gain with feed back and without feedback.[6+6+4]

7. (a) With the help of neat circuit diagram, explain the following applications of OP-AMP.
   i. Multiplier
   ii. differentiator
   iii. Subtractor.

   (b) Design a scaling adder circuit using OP-AMP, to give the output voltage $V_o = -(3_{V1} + 4_{V2} + 5_{V3}), where\ V_1,\ V_2\ and\ V_3$ are the input voltages given to the circuit.. [10+6]

8. (a) Explain how a shift register is used as a Ring counter. Draw the O/P waveform from each flip-flop of a 3-stage unit.

   (b) Prove that if w′x + yz = 0, then wx + y′ (w′+z′) = wx + xz + x′z′ + w′y′z.

   (c) Represent the given negative numbers in sign-magnetude, 1'S and 2'S complement representation in 12-bit format.
   i. -64
   ii. -512.. [6+6+4]

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