

B. Tech III Year I Semester Examinations, May/June - 2012**BASIC ELECTRONICS****(MATALLURGY AND MATERIAL ENGINEERING)****Time: 3 hours****Max. Marks: 75**

Answer any five questions
All questions carry equal marks

- 1.a) Derive an expression for a ripple factor in a full wave rectifier with resistive load.
b) A half wave rectifier has a load of $3.5k\Omega$. If the diode resistance and secondary coil resistance together have a resistance of 800Ω and input voltage has a signal voltage of peak value $240v$ calculate.
 - i) Peak, average and RMS value of current following
 - ii) DC power output
 - iii) Efficiency of the rectifier. [7+8]
- 2.a) Explain two methods of generation of ultrasonic waves.
b) Give the application of ultra sonic waves in industry and communication system. [8+7]
- 3.a) Explain the input and output characteristics of a transistor in CE configuration.
b) Determine the h-parameters from the characteristics of CB configurations. [7+8]
- 4.a) Draw the circuit of single stage RC coupled Amplifier and explain its principle of operation.
b) Derive an expression for sensitivity of feedback Amplifier. [10+5]
- 5.a) Enumerate the effects of negative feedback on the various characteristics of the amplifier.
b) Describe with necessary derivation, the effect of negative feedback on the bandwidth and distortion in an amplifier. [7+8]
- 6.a) Give the principle of Induction heating. What are the merits of Induction heating?
b) Explain the application of Induction heating for:
 - i) Surface hardening of steel.
 - ii) Annealing of brass and iron. [7+8]
- 7.a) Explain how triggering of an SCR can be controlled by the gate signal supplied.
b) What is the advantage of TRAIC over the SCR? [7+8]
- 8.a) Giving basic set up, explain the principle of Induction heating.
b) Explain the principle of Dielectric heating. [7+8]

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- 1.a) Draw the π -section filter circuit with FWR and explain its working.
b) Determine the value of ripple factor in the case of π filter, given $f = 50$ Hz, $C = 0.1 \mu\text{F}$, $R_L = 4.7 \text{ k}\Omega$. [8+7]
- 2.a) Sketch the circuit for the full wave rectifier. Derive an expression for DC current, DC load diode voltages and the RMS current.
b) A 230V, 60Hz voltage is applied to the primary of a 5:1 step down, center-taped transformer used in a full wave rectifier having a load of 900. If the diode resistance and secondary coil resistance together has a resistance of 100Ω determine the Ω .
i) Dc voltage across the load,
ii) DC current flowing through the load. [7+8]
3. Draw the circuit for voltage shunt feed back and explain its working. Derive the expression for voltage gain with feed back. [15]
- 4.a) Draw the circuit using PNP transistor in C.B. configuration and explain the operation through input and output characteristics.
b) Explain about various current components in a BJT. [8+7]
- 5.a) Explain with circuit diagram a negative feedback amplifier and obtain expression for its closed loop gain.
b) An amplifier with stage gain 200 is provided with negative feedback of feedback ratio 0.05. Find the new gain. [7+8]
- 6.a) Discuss the classification of oscillators based on frequency.
b) Establish the conditions required for oscillations and explain the possible configurations to meet these conditions. [5+10]
- 7.a) Explain the application of Induction Heating for
i. Brazing and
ii. Annealing of Brass and Bronze items.
b) Briefly explain "Thermal Expansion timers". [7+8]
8. Write short notes on the following
a) Welding control,
b) Resistance welding,
c) Energy storage welding. [5+5+5]

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- 1.a) What is the law of mass action. A p-type germanium at 300⁰k has conductivity of 300 mho/cm. Calculate the concentration of impurity atoms, holes and electrons. Assume that $\mu_p = 1800 \text{ cm}^2/\text{sec volt}$ and $n_i = 2.5 \times 10^{13} \text{ cm}^{-3}$.
- b) Define the following for a rectifier:
- i) RMS value ii) Ripple factor
iii) Regulation iv) PIV. [5+10]
- 2.a) Sketch the conduction and valence bands before and after diffusion of carriers in a P-N junction.
- b) Explain the majority and minority carriers in the semiconductor. [7+8]
- 3.a) Explain the basic principle and working of hot wire anemometers using bridge circuit.
- b) Explain the construction and features of different form of metal foil strain gauges with diagram. [8+7]
- 4.a) Draw and explain the heat control circuit for resistance welding.
- b) Compare and contrast the following timers:
- i) Thermal Timers ii) Electro-mechanical Timers iii) Electronic Timers. [7+8]
- 5.a) Explain magnetic deflection system employed for deflecting the beam in C RO. Derive the expression for magnetic deflection sensitivity.
- b) Explain the need of coating the screen with fluorescent materials and list different fluorescent materials commonly used. [8+7]
- 6.a) State and briefly explain Barkhausen criterion for oscillation.
- b) Draw the circuit diagram of a general oscillator and obtain the maintenance condition and the frequency of oscillations. [7+8]
- 7.a) Classify the timers according to the function and the technique used to achieve the industrial timing.
- b) List the electronic welding controls used in resistance welding. [8+7]
- 8.a) Explain how a transistor can be used as a switch.
- b) Define the following in CE configuration:
- i) Large-signal current gain. ii) d.c. current gain and iii) Small-signal current gain.
- c) Explain how S C R can be used as a controlled rectifier. [5+5+5]

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- 1.a) Explain the diffusion process that takes place at the junctions of a semiconductor diode and explain the presence of a depletion region.
b) Derive an expression for Fermi level in the P-type and N-type semiconductors. [7+8]
- 2.a) Explain briefly about ultrasonics.
b) Describe how ultrasonics can be generated using mechanical generators. [8+7]
- 3.a) Determine the h-parameters from the characteristics of Common emitter configurations.
b) Derive the relationship between h_{FE} and h_{fe} . [7+8]
- 4.a) Draw the V-I characteristics of a DIAC and explain its working principle .
b) Why phase shift through the R-C feed back network of R-C phase shift oscillator is to be 180° ? Explain. [7+8]
5. Draw the circuit and explain how SCR can be used for over voltage protection. [15]
- 6.a) Draw the circuit of Hartley oscillator and explain its working. Drive the expressions for frequency of oscillation and condition for starting of oscillation.
b) Discuss the frequency range of RC and LC oscillator. [10+5]
7. What are constituent circuit blocks of industrial timing circuits? Explain the functioning of each of them. [15]
- 8.a) Explain the principle of Dielectric heating and List the applications of Dielectric heating.
b) Explain the use of Ultrasonic waves in Degassing of liquids. [7+8]

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