Code No: RT21023 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Jan - 2015
BASIC ELECTRONICS AND DEVICES
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Define Mobility
   b) Explain the operation of Light Emitting Diode.
   c) Define Load and Line Regulation.
   d) What is expression for ripple factor when capacitor filter is used with half wave rectifier?
   e) List out the advantages of negative feedback.
   f) Show that $\mu = g_m \, r_d$ in a Field Effect Transistor.
   g) Why RC oscillators are not used at High Frequencies.
   h) Define Q-Point.
   i) Draw the simplified h-parameter model of a Bipolar Junction Transistor.
   (2M+3M+2M+2M+3M+3M+2M+2M+3M)

PART-B

2. a) A sample of germanium has a n type impurity concentration of $3x10^{14}$ donors/cm^3 and p type impurity concentration of $4x10^{14}$ acceptors/cm^3. Find the values of n and p at room temperature.
   d) What is diffusion and drift phenomenon? Derive Einstein's relationship.
   c) In a Germanium semiconductor with step grading $N_D=2000N_A$ with N_A corresponding to 1 part in 10^8. Find the value of contact potential. (6M+5M+5M)

3. a) Derive an expression for Transition Capacitance of a diode.
   b) Explain the operation of tunnel diode. (8M+8M)

4. a) Derive the expressions for PIV, Conversion Efficiency and TUF of a Bridge rectifier.
   b) Explain the operation of series and shunt voltage regulators and also mention their performance factors. (8M+8M)

5. a) Explain the necessity of biasing a Transistor. Derive the Q-point of a self-bias circuit.
   b) Explain the stabilization of Q-point using sensistor and thermistor. (8M+8M)

6. a) Explain the construction and operation of depletion and enhancement mode MOSFET.
   b) Draw and discuss the VI characteristics of a silicon controlled rectifier. (8M+8M)

7. a) Derive an expression for frequency of oscillation of a RC Phase shift oscillator.
   b) Quantitatively explain the effect of negative feedback on input and output resistances.
   (8M+8M)
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Code No: RT21023 **R13** SET - 2

II B. Tech I Semester Regular Examinations, Jan - 2015
BASIC ELECTRONICS AND DEVICES
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Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) What is doping? Explain the necessity.
b) Differentiate between Avalanche and Zener breakdowns.
c) Explain the operation of series regulator.
d) Derive the PIV of a bridge rectifier.
e) What is the need for biasing? Explain.
f) Compare BJT and FET.
g) Draw the h parameter model of a common collector amplifier.
h) Compare CE, CB and CC amplifiers.
i) What is Barkhausen Criterion? (2M+2M+2M+2M+3M+3M+2M+3M+3M)

PART-B

2. a) A sample of germanium has been added with 10^{14} donors/cm^3 and 7x10^{13} acceptors/cm^3. Find the values of n and p at room temperature if the resistivity is 60 Ω-cm.
b) What is electron gas theory description of metals?. Derive an expression for current density in metals and also derive an expression for current density in semiconductors. (8M+8M)

3. a) Explain VI characteristics of a Zener diode.
b) Calculate the factor by which the reverse saturation current in Ge diode is multiplied when the temperature is increased from 25 to 70 degrees centigrade.
c) Explain the operation of photodiode. (6M+5M+5M)

4. a) Derive the expressions for PIV, Ripple factor , Conversion Efficiency and TUF of a Full wave rectifier.
b) A sinusoidal voltage of amplitude 20V, 50Hz is applied to a half wave rectifier. If R_L=1000Ω, R_f=10Ω, R_r=∞, Find the values of i) Conversion Efficiency ii)Ripple factor iii) Percent Regulation (8M+8M)

5. a) Explain the input and output characteristics of a Common Emitter Configuration.
b) Draw the exact h parameter model of a Transistor suitable for any configuration. Derive expressions for voltage gain, current gain, input impedance and output impedance of an amplifier using exact h parameter model (8M+8M)

6. a) Derive an expression for voltage gain of a Common Drain Amplifier.
b) Explain qualitatively the operation of field effect transistor. (8M+8M)

7. a) Derive an expression for frequency of oscillation and condition for sustained oscillations of a Wien Bridge oscillator.
b) Enumerate the steps in the linear analysis of negative feedback amplifiers (8M+8M)
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Code No: RT21023 **R13** SET - 3

II B. Tech I Semester Regular Examinations, Jan - 2015
BASIC ELECTRONICS AND DEVICES
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Explain different topologies in negative feedback amplifiers?
   b) Define cut-in voltage of a diode.
   c) Define ripple factor, rectification efficiency of a rectifier.
   d) What is the purpose of using a filter in a power supply unit?
   e) What are the various modes of operation of an SCR?
   f) State the advantages of push-pull amplifiers.
   g) Draw the low frequency model of a FET.
   h) Show that gain reduces with negative feedback.
   i) Differentiate between an oscillator and an amplifier.
   (3M+2M+3M+2M+3M+2M+2M+3M+2M)

PART-B

2. a) What is Hall effect?. Derive an expression for hall coefficient.
   b) Find the resistivity of intrinsic silicon and Germanium at room temperature. (8M+8M)

3. a) Explain the operation of i) PIN diode ii) Varactor diode
   b) Explain the VI characteristics of pn junction diode. Discuss about the effect of temperature on diode characteristics. (8M+8M)

4. a) Derive the expressions for ripple factor of a full wave rectifier using capacitor filter.
   b) Explain how Zener diode acts as a regulator. (8M+8M)

5. a) What are the various current gains in a Transistor and derive the relationship between them.
   b) Derive simplified h parameter model of a transistor. State it's advantages. Derive an expression for voltage gain of CE, CB and CC amplifiers using simplified h parameter model.
   c) Derive the necessary condition to avoid thermal runaway in a transistor. (6M+5M+5M)

6. a) Explain the two transistor analogy of an SCR.
   b) Explain about specifications of a Thyristor.
   c) Perform DC and AC analysis of a common source amplifier. (6M+5M+5M)

7. a) Quantitatively explain the effect of negative feedback on Band width and sensitivity.
   b) Explain the operation of push-pull power amplifier. (8M+8M)
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Code No: RT21023 **R13** SET - 4

II B. Tech I Semester Regular Examinations, Jan - 2015
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Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1. a) Draw the energy band diagram of an Insulator, Semiconductor and a metal.
   b) What is depletion region?
   c) Define peak inverse voltage of a rectifier.
   d) State the advantages of a bridge rectifier.
   e) What are various regions of operation of a BJT?
   f) Explain early effect.
   g) What is thermal run away?
   h) Draw the electrical equivalent of a crystal.
   i) What is pinch off voltage? (3M+2M+2M+3M+2M+3M+3M+2M+2M)

PART-B

2. a) What is Energy band theory description of a elements. Draw the energy band diagrams of metal, insulator and a semiconductor.
   b) Derive an expression for continuity equation.
   c) Find the concentration of electrons and holes in a p type Ge semiconductor at 300K if the resistivity is 60 $(\Omega\text{-cm})^{-1}$ (6M+5M+5M)

3. a) Explain the operation of Tunnel diode
   b) Explain various current components in a diode. (8M+8M)

4. a) What are the various filter circuits used in rectifiers. Compare their performance.
   b) Quantitatively explain the operation of half wave rectifier. (8M+8M)

5. a) Explain how transistor acts as a switch.
   b) Analyze CE with R_e circuit using h-parameter model. (8M+8M)

6. a) Explain the operation of a Field effect Transistor. Derive an expression for pinch-off voltage of a FET.
   b) Explain the operation of IGBT. (8M+8M)

7. a) Draw the different topologies in a negative feedback amplifier. Enumerate the steps in the analysis of negative feedback amplifiers.
   b) What is an oscillator? Derive necessary condition for the oscillator to produce oscillations. Explain about amplitude and frequency stability of oscillators. (8M+8M)
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