Code No: R1621023 **R16** SET - 1

II B. Tech I Semester Regular Examinations, October/November - 2017
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 **FOUR** Questions from **Part-B**

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PART –A

1.	a)	State the continuity equation	(2M)
	b)	List the applications of Light Emitting Diode.	(2M)
	c)	Define peak inverse voltage of a rectifier.	(2M)
	d)	Draw the h parameter model of a common collector amplifier	(3M)
	e)	Compare BJT and FET	(2M)
	f)	List different topologies in negative feedback amplifiers?	(3M)

PART -B

2.	a)	Discuss about the charge densities and Fermi level in a semiconductor having impurities	(7M)
	b)	Describe the generation and recombination of charges in semiconductor devices	(7M)
3.	a)	Discuss about the V-I characteristics of a p-n junction diode, and its temperature dependence	(7M)
	b)	What is photo diode? Explain its construction and operation	(7M)
4.	a)	Draw the circuit diagram for full-wave bridge rectifier and explain its principle of operation	(7M)
	b)	Calculate the percentage ripple for the voltage developed across a 120 μF capacitor when providing a load current of 80 mA. The full-wave rectifier operating from the 50Hz supply develops a peak rectified voltage of 24 V	(7M)
5.	a)	Prove that the transistor acts an amplifier with suitable circuit diagram	(7M)
	b)	What are the important parameters one can obtain from the input, and output characteristics of CE configuration? Discuss about them	(7M)
6.	a)	Explain the importance of FET as an amplifier	(7M)
	b)	Describe the operation of an enhancement type MOSFET	(7M)
7.	a)	Explain the effects of negative feedback on amplifier characteristics?	(7M)
	b)	Draw the circuit diagram of Colpitt's oscillator and explain its operation?	(7M)
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Code No: R1621023 **R16** SET - 2

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2. Answer **ALL** the question in **Part-A**
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PART –A

1.	a)	Define the terms Mobility and Conductivity	(2M)
	b)	Describe how diffusion and transition capacitances differ	(2M)
	c)	Define Load and Line Regulation	(2M)
	d)	Compare CE, CB and CC amplifiers	(3M)
	e)	Write the applications of Silicon control rectifiers	(3M)
	f)	What is Barkhausen Criterion?	(2M)

PART -B

2.	a)	Discuss about Fermi level in intrinsic and extrinsic semiconductor materials	(7M)
	b)	Determine the concentration of free electrons and holes in a sample of Ge at 300^0K which has a concentration of donor atoms equal to 2×10^{14} atoms/cm^3 and a concentration of acceptor atoms equal to 3×10^{14} atoms/ cm^3. Is this p – or n –type Germanium? Justify your answer.	(7M)
3.	a)	Explain principle of operation of LED, and PIN diodes	(7M)
	b)	Give the quantitative theory of p-n diode currents and hence deduce the diode equation.	(7M)
4.	a)	Explain the operation of a π- section filter, and derive expression for the ripple factor.	(7M)
	b)	A dc power supply circuit is to be designed for the given specifications: V_{dc} = 5V, I_{dc} = 200 mA. Use Si diodes and a centre tapped transformer. Assume necessary data.	(7M)
5.	a)	Give the analytical expressions for transistor characteristics	(7M)
	b)	What is thermal Runaway? How do you avoid it in amplifier circuits using BJT? Derive suitable expression to avoid it	(7M)
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Code No: R1621023 **R16** SET - 2

6.	a)	Discuss about the transfer characteristics of JFET, and give the importance of Shockley's equation	(7M)
	b)	Give the construction details and characteristics of depletion type MOSFET	(7M)
7.	a)	With the help of a suitable BJT based voltage series feedback amplifier diagram, explain the features and benefits of negative feedback in amplifiers	(7M)
	b)	Derive the expression for frequency of oscillation in a Hartley Oscillator.	(7M)

Code No: R1621023 **R16** SET - 3

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2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1.	a)	What is the importance of Law of Junction	(2M)
	b)	Differentiate between Avalanche and Zener breakdowns.	(3M)
	c)	State the advantages of a bridge rectifier.	(2M)
	d)	Distinguish cascade and cascode amplifiers.	(3M)
	e)	Draw the low frequency model of a FET.	(2M)
	f)	Show that gain reduces with negative feedback	(2M)

PART -B

2.	a)	State and explain the Hall Effect. Mention its applications.	(7M)
	b)	A sample of Ge is doped to the extent of 10^{14} donor atoms/cm^3 and 7×10^{13} acceptor atoms/cm^3. At the temperature of the sample, the resistivity of pure Ge is 60 ohm – cm. If the applied electric field is 2 V/cm, find the total conduction current density.	(7M)
3.	a)	Explain the terms '*Avalanche breakdown*' and '*Zener breakdown and give examples.*	(7M)
	b)	Discuss about working principle of Varactor diode and photo diode with neat sketches	(7M)
4.	a)	Discuss about L –section filter and derive the expression for the ripple factor.	(7M)
	b)	A full-wave single phase rectifier employs π- section filter consisting of two 10 µF capacitances and a 20 H choke. The transformer voltage to center tap is 300 V. The load current is 50 mA. Calculate the dc output voltage and the ripple voltage. Assume that the resistance of the choke is 200 ohms.	(7M)
5.	a)	Derive the expression for current gain in CE configuration in terms of current gain of CB configuration	(7M)
	b)	With suitable sketches, explain input and output characteristics of CC configuration in detail	(7M)
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Code No: R1621023 **R16** SET - 3

6. a) What is the significant difference between the construction of an enhancement type MOSFET and a depletion type MOSFET? (7M)
   b) Given a depletion type MOSFET with I_{DSS} = 6 mA and Vp = - 3V, determine the drain current at V_{GS} = - 1 V, 0 V, 1V, and 2 V. Compare the difference in current levels between -1 and 0 V with the difference between 1 and 2 V. In the positive V_{GS} region, does the drain current increase at a significantly higher rate than for negative values? Is there a linear or nonlinear relationship between I_D and V_{GS}? Explain (7M)

7. a) The total harmonic distortion of an amplifier is reduced from 15% to 3% when 4% negative feedback is used. Find (i) voltage gain without feedback (ii) voltage gain with feedback (7M)
   b) Describe the crystal oscillator. What is the advantage of a crystal oscillator over an LC oscillator? (7M)

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II B. Tech I Semester Regular Examinations, October/November - 2017
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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1.	a)	Draw the energy band diagram of an Insulator, Semiconductor and a metal.	(3M)
	b)	Write the applications of Varactor diode	(2M)
	c)	What are the different types of Regulators	(2M)
	d)	What is thermal run away?	(2M)
	e)	Show that $\mu = g_m r_d$ in a Field Effect Transistor.	(3M)
	f)	Differentiate between an oscillator and an amplifier	(2M)

PART -B

2.	a)	Describe the terms intrinsic and extrinsic semiconductors of both P type and N type	(7M)
	b)	Describe the differences between n - type and p - type semiconductor materials with suitable examples.	(7M)
3.	a)	What are the current components in a p-n diode? Deduce the expression for diode equation.	(7M)
	b)	With suitable sketches explain the principle of operation of Tunnel Diode.	(7M)
4.	a)	With suitable sketches, explain the operation of a full-wave rectifier with capacitive filter. Derive the expression for the ripple factor.	(7M)
	b)	A full-wave rectifier has an output dc voltage of 150 V along with unwanted ripple voltage $V_{r,rms}$ = 15 V. If a C-R-C filter is used between the rectifier and a load of 5000 ohms, calculate the ripple factor at load. Assume that filter has the component values in the same order as 15 µF, 500 ohms, and 10 µF.	(7M)
5.	a)	With the help of the CE configuration circuit, explain input, output characteristics and various regions of the configuration in detail.	(7M)
	b)	Discuss about the CB configuration and its input, output characteristics in detail.	(7M)
6.	a)	Sketch a p-channel enhancement type MOSFET with proper biasing applied and indicates the channel, the direction of electron, and the resulting depletion region.	(7M)
	b)	Discuss the Principle of operation and characteristics of Thyristors	(7M)
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Code No: R1621023 **R16** SET - 4

7. a) Explain the nature of feedback in an emitter follower circuit. State the advantages of this circuit and mention its use. Can this circuit be used as a voltage amplifier? (7M)

   b) With the help of suitable schematic and description, show that both positive and negative feedback are used in a Wien Bridge oscillator. Establish the condition for oscillations (7M)