Code No: RT21041 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Jan - 2015
ELECTRONIC DEVICES AND CIRCUITS
(Com. to ECE, EIE, ECC)

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 forbidden energy gap.
   b) What is avalanche break down mechanism in Zener diode?
   c) Define punch through mechanism in BJT.
   d) List the applications of tunnel diode
   e) Which is the most commonly used transistor configuration. Why?
   f) Draw the symbol for N-channel E-MOSFET.
   g) What is PIV in case of half wave and full wave rectifier?
   h) Define Thermal runaway.
   i) Write the voltage and current equation for hybrid parameters.
   (2M+3M+2M+2M+3M+2M+3M+2M+3M)

PART-B

2. Explain semi-conductors, insulators and metals classification using energy band diagrams. (16M)

3. a) With a neat diagram explain the working of an open circuited PN junction. Give Necessary response curves.
   b) The current flowing in a germanium PN junction diode at room temperature is $9x10^{-7}$A when the large reverse voltage is applied. Calculate the current flowing when 0.1V forward bias is applied. (10M+6M)

4. a) With circuit and necessary waveforms explain the operation of bridge rectifier.
   b) An ac supply of 220V is applied to a half wave rectifier circuit through a transformer with a turns ratio of 10:1. Find (i) DC output voltage (ii) PIV. Assume the diode to an ideal one. (10M+6M)

5. With the help of a neat diagram show different current components in a transistor. (16M)

6. a) Differentiate bias stabilization and compensation techniques
   b) What are the drawbacks transistors fixed bias circuits. (10M+6M)

7. a) Explain A FET amplifier in the common source configuration with a neat circuit diagram.
   b) A FET amplifier in the common source configuration uses a load resistance of 250kΩ and the transconductance is 0.5mA/V. What is the voltage gain of the amplifier? Given r_d =200kΩ. (10M+6M)

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Time: 3 hours Max. Marks: 70

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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 Hall effect
   b) Write diode current equation
   c) Give the values of ripple factor and efficiency for full wave rectifier.
   d) Define transconductance
   e) Define stability factor?
   f) What is the significance of h-parameters?
   g) Draw the symbol for SCR.
   h) List the applications of UJT
   i) Define Eber's Moll model of a BJT. (2M+2M+3M+2M+2M+3M+2M+3M+3M)

PART-B

2. a) Derive the expression for drift and diffusion current for semiconductors.
   b) Find the diffusion coefficients of holes and electronics for germanium at 300^o K. The carrier mobilities in cm^2/V-s at 300^0 K for holes and electronics respectively 3,600 and 1,700. Density of carrier is $2.5x10^{13}/cm^2$. Boltzmann constant k =$1.38x10^{-23}$ J/^{0}K, e = $1.602x10^{-19}$C. (10M+6M)

3. Sketch and explain the volt-ampere characteristics of a tunnel diode. Indicate the negative resistance portion. (16M)

4. a) Derive the expression for ripple for the circuit FWR with inductor filter.
   b) A full - wave single phase rectifier employs a π - section filter consisting of two 4 μF capacitances and a 20 H choke. The transformer voltage to the center tap is 300 V_{rms}. The load current is 500mA. Calculate the dc output voltage and the ripple voltage. The resistance of the choke is 200 Ω (8M+8M)

5. a) With a neat construction diagram explain the principle of operation of a JFET. Give its characteristics.
   b) An n - channel JFET has I_{DSS} =10mA and V_P = - 2V. Determine the drain source resistance r_{DS} for (i) V_{GS} =0V. (ii) V_{GS} = - 0.5V (10M+6M)

6. a) Explain the need of biasing and stabilization
   b) In a silicon transistor with a fixed bias, V_{cc}= 9 V, R_c= 3 kΩ, R_B= 8kΩ, β = 50, V_{BE}= 0.7V. Find the operating point and stability factor. (10M+6M)

7. a) Compare BJT and FET amplifiers.
   b) Give the approximate h-parameter conversion formulae for CC and CB configuration in terms of CE. (8M+8M)
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Code No: RT21041 **R13** SET - 3

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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) Define drift and diffusion current
b) How the Zener diode act as voltage regulator
c) Define radiant intensity for LED.
d) Give the ripple factor and efficiency for full wave rectifier with capacitive filter.
e) What is early effect?
f) What is the relation between α and β in BJT?
. g) What is quiescent point?
h) Compare between CS and CG in FET amplifier
i) Draw the symbol for p- channel E-MOSFET (3M+3M+2M+3M+2M+2M+2M+3M+2M)

PART-B

2. a) Explain Hall Effect in semiconductors.
b) The resistivity of doped silicon material is $9x10^{-3}$ Ω-m. The Hall coefficient is $3.6x10^{-4}$ m^3/C assuming single carrier conduction; find the mobility and density of charge carriers. e= $1.602x10^{-19}$Colomb (10M+6M)

3. a) Derive the diode current equation?
b) A silicon diode has reverse saturation current of 2.5 μA at 300^o K. Find forward voltage for a forward current of 10 mA. (12M+4M)

4. Explain the operation of half wave and full wave rectifiers with and without capacitor filter. (16M)

5. a) Explain input and output characteristics of common emitter configuration.
b) A certain transistor has a current gain of 0.99 in CB configuration. Calculate its current gain in the CE configuration another transistor has β =80, determine it's α. (12M+4M)

6. For the improvement of stability of the operating point what suggestions you would like to give for self-bias. Discuss with the help of stability factors. (16M)

7. a) Draw the hybrid parameter equivalent circuit for an n-p-n common emitter transistor and briefly explain.
b) A transistor used in CE amplifier connection has the following set of h parameters, h_{ie}=1kΩ, h_{fe}=100, $h_{re}=5\times10^{-4}$, $h_{oe}= 2\times10^{-5}\Omega^{-1}$, R_s=15kΩ, R_L=5kΩ. Determine input impedance, output impedance, current gain and voltage gain. (8M+8M)
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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 continuity equation
b) List the applications of Varactor diode
c) What is meant by transition & space charge capacitance of a diode?
d) What is the effect of temperature on PN junction?
e) Give the theoretical values for ripple factor and efficiency of bridge rectifier
f) What are the three configurations of a transistor amplifier?
g) In a transistor, IC=0.95mA, IE=1mA, determine base current and β in CB configuration
h) Define pinch- off- voltage of JFET.
i) What are the advantages of CE amplifier? (2M+3M+3M+2M+3M+2M+3M+2M+2M)

PART-B

2. a) Explain Fermi level in an extrinsic semiconductor with energy diagrams.
b) In an N-type semiconductor, the Fermi-level lies 0.3 eV below the conduction band at 27^0C, if the temperature is increased to 55^0C, find the new position of the Fermi- level. (12M+4M)

3. Write short notes on i) SCR ii) Photo diode iii) LED (6M+6M+4M)

4. a) For a full wave rectifier with shunt capacitance filter derive expression for ripple factor using approximate analysis.
b) Give the list of different filters used in rectifier and their merits and demerits. (8M+8M)

5. a) Explain the operation of N-channel enhancement type MOSFET with the help of it's (I_D-V_{DS}) and (I_D-V_{GS}) characteristics.
b) Distinguish between JFET and MOSFET. (10M+6M)

6. a) Draw the transistor biasing circuit using fixed bias arrangement and explain its principle with suitable analysis.
b) Calculate the quiescent current and voltage of collector to base bias arrangement using the Following data: V_{cc}= 10 V, R_b= 100 K, R_c = 2 K, β = 50 and also specify a value of R_b so that V_{ce} = 7 V. (10M+6M)

7. a) Define h-parameters along with its units.
b) Given I_E= 2.5mA, h_{fe}= 140, h_{oe}= 20μs and h_{ob}= 0.5μs. Determine the common-emitter hybrid equivalent circuit. (4M+12M)

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