SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics & Communication Engineering
B. Tech. 2nd Semester ECE / Backlog Major Examination (Even) 2024-25

Entry No: 24BEC055

Date:

Total Number of Pages:[02]

Total Number of Questions: [07]

Course Title: Solid State Device (ECL DC 102) / Basic Electronics (ECL 1010)

Time Allowed: 3 Hour

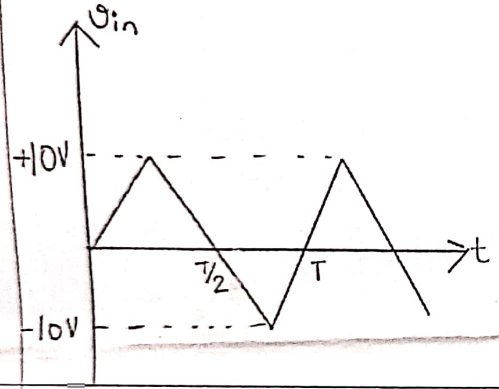
Max Marks: [40]

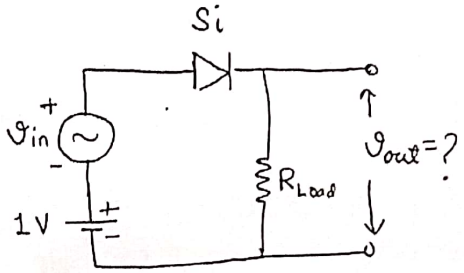
Instructions / NOTE:

i. Attempt all questions.
ii. Assume an appropriate data / information, wherever necessary / missing.
iii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iv. Important values: k (Boltzmann Constant) = 1.38×10^{-23} J/K; e (charge on an electron) = 1.6×10^{-19} C; ε_s (permittivity of Silicon) = 8.85×10^{-14} F/m .

Section A (2×5=10 Marks)

Q1. (a) Draw the exact output wave for the following given input. [CO2]





(b) (i) If a reverse saturation current of a pn-junction diode is 25 μA at 20° C. Then what will be its value at 50° C? [CO2]
(ii) Why input impedance of a MOS device very high?

(c) A 20 V peak-to-peak sine wave of 50 Hz is applied to the input of half-wave rectifier using a pn-junction diode of forward bias resistance of 50 ohms. Calculate the DC output power delivered to the load of 2.5 KOhms. [CO2]

(d) If CE current gain of a given BJT device is 50. Then find the value CB current gain of this BJT device. [CO3]

(e) (i) Define relation / expression of all the three stability factors used during biasing a BJT. [CO3]

OR

(ii) Draw the circuit diagram of Voltage doubler circuit and explain its working.

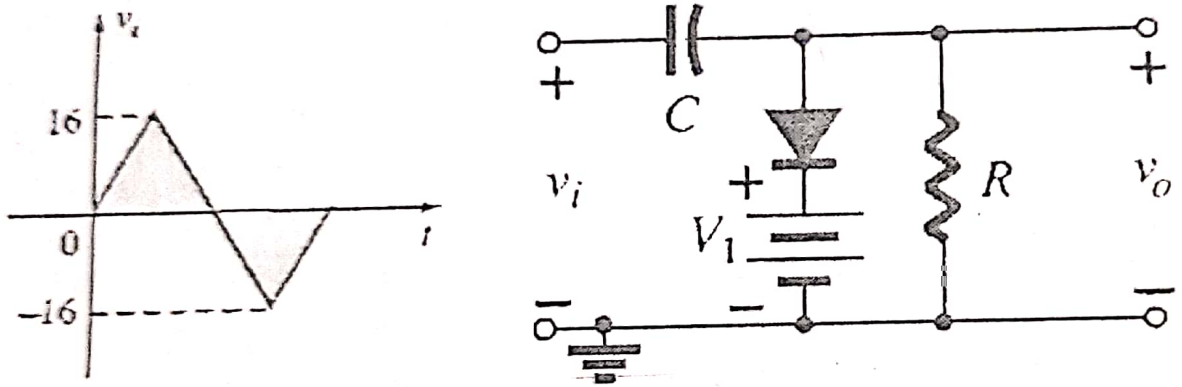
Section B (6-Questions of 5 Marks Each)

Q2. (a) Define Fermi-level and Fermi-Dirac distribution function. **(02 Marks)**
(b) What is Hall Effect? Explain with diagram. Derive the relation of Hall Voltage (V_H) of a n-type semiconductor. **(03 Marks)** [CO1]

Q3. (a) Draw and explain the construction of n-channel Enhancement type of MOSFET and explain its working and characteristics. **(05 Marks)** [CO4]

------OR------

(b) Draw and explain the construction of p-channel Depletion type of MOSFET and explain its working and characteristics. **(05 Marks)**

Q4.	(a) Calculate the built-in potential barrier (V_{bi}) in a pn junction. Consider a silicon pn junction at T= 300 K with doping concentrations of $N_a = 2\times10^{17}$ cm^3 and $N_d = 10^{15}$ cm^3. **(2.5 Marks)** (b) For the pn junction diode of Q4(a). What will be the width of depletion region, if a reverse bias voltage of 5 volts is applied to it? **(2.5 Marks)**	[CO1]
Q5.	(a) For the following circuit with silicon diode, draw the output waveform ($V_1 = 5V$) and also tell the type of network it is.  **(02 Marks)**	[CO2]
	(b) Draw h-parameter equivalent model of a npn transistor in CE-configuration and describe the parameters. **(1.5 Marks)**	[CO3]
	(c) Draw r_e-equivalent model of a pnp transistor in CE-configuration and describe the parameters. **(1.5 Marks)**	[CO3]
Q6.	Draw the circuit diagram of CE – configuration using pnp transistor and explain its I/O characteristics. **(05 Marks)**	[CO3]
Q7.	In the following circuit, find Z_{in} and A_v if Vcc = +15V, R_B = 100 Kohm, R_E = 100 Ohm, β = 50.	[CO3]
	In the following circuit find V_C and V_B (R_B = 100 KOhm, R_C = 4 KOhm and β = 45)	

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics & Communication Engineering
B. Tech.2nd Semester ECE / Backlog Mid-semester Examination (Even) 2024-25

Entry No: | | | | | | | | | |

Total Number of Pages:[01]

Date:

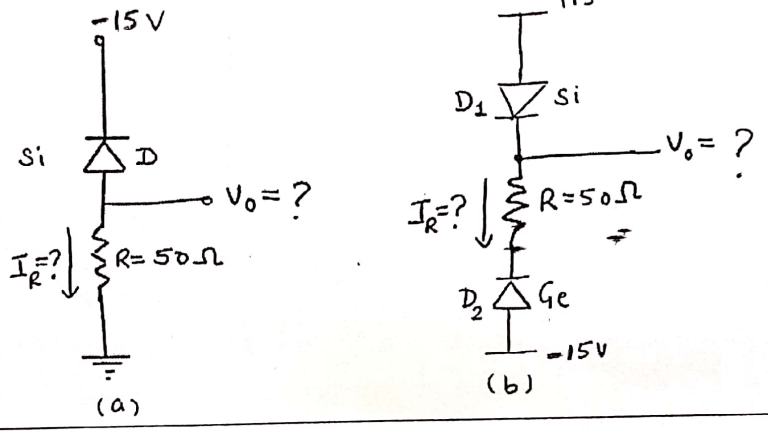
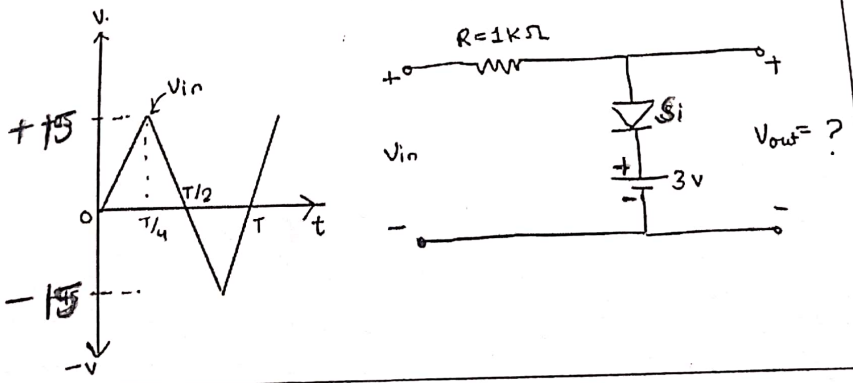
Total Number of Questions: [04]

Course Title: Solid State Device (ECL DC 102) / Basic Electronics (ECL 1010)

Time Allowed:1 Hour 30 Minutes **Max Marks: [20]**

Instructions / NOTE :Attempt All Questions.

i. **Support your answer with neat freehand sketches/diagrams, wherever appropriate.**
ii. **Assume an appropriate data / information, wherever necessary / missing.**

	Section – A (5 Marks)		
(a)	If the reverse saturation current flowing through a pn-junction silicon diode is 20 micro-amperes. Find the forward current flowing through it when a 0.75 V is applied across it at room temperature ?	[01]	CO1
(b)	Find the current I_R and the voltage Vo in the following circuits? 	[02]	CO2
(c)	Draw the output waveform of the following circuit? 	[02]	CO2
	Section – B (15 Marks)		
	Explain the difference between Avalanche Break-down and Zener Break-down	[05]	CO1
	Draw the circuit diagram of and IO characteristics (with all region of operations) of npn common-base amplifier and explain "Early Effect"?	[05]	CO1
	Draw the bridge rectifier circuit and derive its ripple factor? OR Explain the working of Zener diode as a voltage regulator.	[05]	CO2

After successful completion of this course students will be able to achieve this

Course Outcomes

Course Outcome	CO

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics & Communication Engineering
B. Tech. (ECE) Minor-1 Examination, Feb. 2024

Entry No: | | | | | | | | | | |

Total Number of Pages: [01]
Total Number of Questions: [05]

Course Title: Basic Electronics
Course Code: ECL DC102

Time Allowed: 1:00 Hours **Max Marks: [20]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume any missing data to suit the case / derivation / answer.
iv. Abbreviated terms have their usual meaning.

Q1. Explain the operation of PN junction diode in both biasing schemes with IV characteristics. [4] CO2

Q2. Design a 4-input AND gate using PN junction diodes and explain its operation with truth table. [4] CO2

Q3. A copper wire of *2 mm* diameter with conductivity of 5.8×10^7 *s/m* and electron mobility of 0.0032 $m^2/V.s$ is subjected to an electric field of *20mV/m*. Find: [4] CO1

(A) Charge density of free electrons
(B) Current density
(C) Current flowing in the wire
(D) Electron drift velocity.

Q4. Discuss the different diode equivalent circuits with schematic diagrams and IV characteristics. [4] CO2

Q5. A Silicon diode has reverse saturation current of $5\mu A$ at room temperature. Find the forward bias voltage for a forward bias current of *50mA*. [4] CO1

CO:

1. To understand the semi-conductor physics
2. To familiar with PN junction diode and its applications

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics & Communication Engineering
B. Tech. (ECE) Major Examination, May 2024

Entry No: | | | | | | | | | |

Time allowed: 3 Hour

Total Number of Pages: [2]

Total Number of Questions: [8]

Course Title: Basic Electronics

Course Code: ECL DC102

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume any missing data to suit the case / derivation / answer.
iv. Abbreviated terms have their usual meaning.

Q1. Write the corresponding correct answer with option in your answer sheet. [8] CO1

I. An electron-Volt (eV) is a unit of _____.
(a) Energy (b) Power (c) Charge (d) Momentum

II. Which element has four valence electrons?
(a) Conductors (b) Insulator (c) Semiconductors (d) None of them

III. The temperature coefficient of resistance of semiconductors is _____.
(a) Positive (b) Negative (c) Zero (d) Infinite

IV. A semiconductor in its purest form is called _____.
(a) Pure (b) Doped (c) Intrinsic (d) Extrinsic

V. The reverse bias diode capacitance is termed as _____.
(a) Diffusion (b) Storage (c) Reverse (d) Transition

VI. _____ is the maximum amount of reverse voltage which can be applied on a diode before breakdown point is reached.
Zener (b) Breakdown (c) PIV (d) Threshold

VII. A _____ is considered as current controlled device
(a) Diode (b) Resistor (c) FET (d) BJT

VIII. What is the barrier potential of Germanium at room temperature?
(a) 0.7V (b) 0.3V (c) 0.5V (d) 0.4V

Q2. Explain the operation of enhancement type NMOS device with input and output characteristics. [6] CO2

Q3. What are the applications of thyristor. How SCR works? Plot the SCR characteristics. [6] CO4

Q4. Find VDS and VGS in the given figure 1, provided that I_D = 5 mA. [6] CO2

Q5. Derive the expression for stability factor for voltage divider bias scheme. [6] CO3

Q6. Determine Q-point values for the circuit in figure 2 and plot the DC load line. [6] CO3

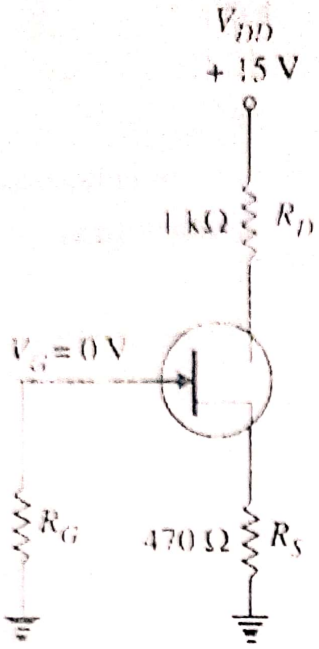


Figure 1

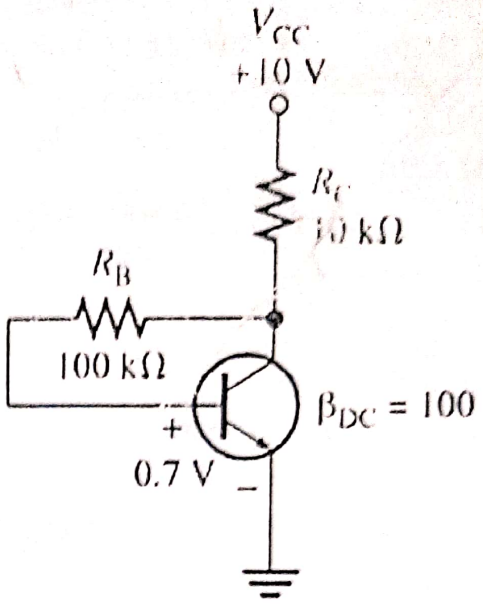


Figure 2

Q7. Explain the hybrid equivalent model for CB configuration of BJT. [6
CO

Q8. What are the criteria for oscillation? Discuss the operation of Wein Bridge oscillator with diagram. [6
CO

Course Outcomes (COs):

1. To learn the semiconductor devices and applications
2. To understand the characteristics and uses of transistors
3. To learn the biasing schemes and small signal analysis
4. To study the thyristors and oscillators

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics & Communication Engineering
B. Tech. (ECE) Minor-2 Examination, Apr. 2024

Entry No: | 2 | 3 | b | e | c | 0 | 0 | 6 | |

Total Number of Pages: [01]
Total Number of Questions: [05]

Course Title: Basic Electronics
Course Code: ECL DC102

Time Allowed: 1:00 Hours

Max Marks: [20]

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume any missing data to suit the case / derivation / answer.
iv. Abbreviated terms have their usual meaning.

Q1. Determine Vo, V1, I, I_L and V2 for the circuit, as given in figure 1 if D1 is a practical diode: [4] CO1

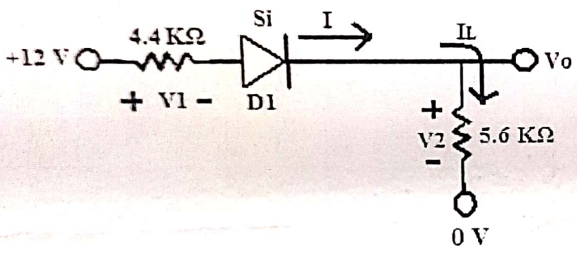


Figure 1

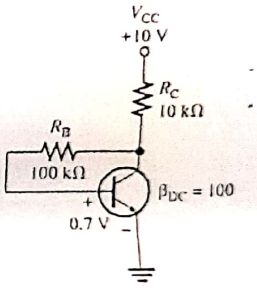


Figure 2

Q2. Explain the operation of CE *npn* transistor with input and output characteristics in detail. [4] CO2

Q3. Derive the expression of input impedance for CE BJT using h-parameter model. [4] CO2

Q4. Determine Q-point values for the circuit, as shown in figure 2. [4] CO2

Q5. Derive the relations among current gains in CE, CB, and CC configurations of BJT. [4] CO2

CO:

1. To understand the applications of diode
2. To understand the fundamentals of BJT

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics and Communication Engineering
B. Tech. (ECE) Minor I Examination (ODD) 2023-24

Entry No: 2 2 b e c 0 8 8 | **Total Number of Pages: [01]**

Date: **Total Number of Questions: [04]**

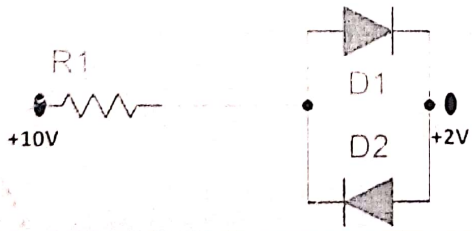
Course Title: Basic Electronics

Course Code: ECL 1010

Time Allowed: 1.0 Hours **Max Marks: [20]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume an appropriate data / information, wherever necessary / missing.

	Section - A		
Q1.	(i) Number of holes is more than electrons in _____type of Semiconductor. (ii)In the intrinsic state of the semiconductor, Fermi level resides in _____. (iii) The diode current doubles with the every ____ degree Celsius increase in the temperature. (iv)If the input voltage to the half-wave rectifier is given as $5\sin(2\pi 500t)$ V then average output is ____ V. (v)The load line intersects to the I-V characteristic curve of the diode at _____ point.	[1×5]	CO1 CO1 CO1 CO3 CO3
	Section - B		
Q2.	What do you mean by an equivalent circuit model? With the neat diagram, explain different circuit modes of the diode.	[05]	CO1
Q3.	Explain the following terms. (i) DC Resistance (ii) Dynamic resistance (iii) Average resistance	[03]	CO1
Q4.	(i) Write a short note on the Zener Diode. What is the use of this diode? (ii) Determine the direction and the magnitude of the current passing through the diode if $R1=210\Omega$ and diodes are made of Silicon. 	[04] [03]	CO1 CO3

Course Outcomes

1. To learn basic concepts of semiconductor devices.
2. Able to understand and use BJT and MOS Devices
3. Learn and able to apply small signal BJT and FET analysis
4. To analyze and design rectifiers and amplifiers.
5. Able to understand advanced semiconductor devices and oscillators

CO	Questions Mapping	Total Marks	Total Number of Students (to be appeared in Exam)
CO1	1(i),(ii), (iii), 2,3,4(i)	15	
CO2			
CO3	1(iv),(v),3	05	