



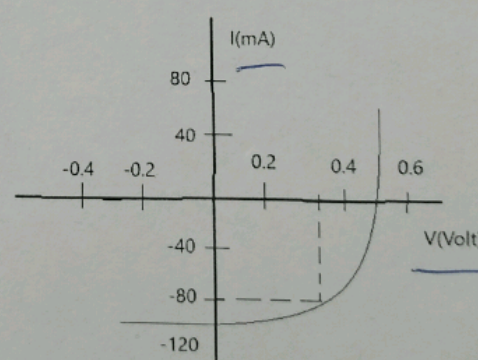
SCHOOL OF ELECTRONICS ENGINEERING (SENSE)
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2024-2025

SLOT: F1+TF1

Programme Name & Branch : B-TECH Electronics Engineering
VLSI Design and Technology
Course Code and Course Name : BEVD201L
Physics of Semiconductor Devices
Faculty Name(s) : Dr. Prachi Sharma
Class Number(s) : VL2024250104205
Date of Examination : 18-10-2024
Exam Duration : 90 minutes
General instruction(s):

Maximum Marks: 50

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)
CO2: Analyze the PN Junction diode characteristics.
CO3: Understand the principles of optoelectronic devices.
CO4: Evaluate the BJT characteristics and equivalent circuits from the device parameters.
CO5: Understand and derive the MOS capacitor characteristics.

Q. No	Question	M	CO	BL
1.	Calculate the open circuit voltage and the output power at a voltage of <u>0.35V</u> for the solar cell characteristics given in the figure below $T = 300\text{ K}$ $I_s = 1\text{ nA}$ 	10	C O 3	B L 3
2.	A BJT is biased at $I_C = 2\text{ mA}$ and $V_{CE} = 5\text{ V}$. Determine <u>junction diffusion resistance</u> , <u>diffusion capacitance</u> , and <u>transconductance</u> for the given values: base width, $W_B = 90\text{ nm}$, base minority carrier diffusion constant, $D_B = 8\text{ cm}^2/\text{s}$, $\beta_F = 80$, $\tau_F = 5\text{ ps}$ and $T = 300\text{ K}$.	10	C O 4	B L 3
3.	a) Explain the advantages and disadvantages of tunnel diode over p-n junction diode.	5	C O	B L
	b) Differentiate between ohmic contact and Schottky contact?	5	2	2
4.	When 3×10^{10} photons each with a wavelength of <u>$0.85\text{ }\mu\text{m}$</u> are incident on a photodiode, an average of <u>1.2×10^{11}</u> electrons are collected at the terminals of the device. Determine :	5	C O 3	B L 3



Vellore Institute of Technology
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	a) Quantum efficiency of the photodiode			
	b) For the quantum efficiency as per part (a), determine the photodiode's responsivity at $0.85 \mu\text{m}$.	5		
5.	An Al-gate p-channel MOS transistor is made on an <u>n-type Si substrate</u> with $N_d = 7 \times 10^{17} \text{ cm}^{-3}$. The SiO_2 thickness is $130 \text{ \AA}$ in the gate region, and the effective oxide interface charge Q_{ox} is $7 \times 10^{10} \text{ qC/cm}^2$. Find the maximum depletion width W_{max} , flat band voltage V_{FB} , and threshold voltage V_T . Given $\Phi_{\text{ms}} = -0.18 \text{ V}$. What would be the minimum capacitance in this case?	10	C O 5	B L 3
