

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
**(END SEMESTER EXAMINATION)**

**CLASS: BTECH**  
**BRANCH: ECE**

**SEMESTER : III**  
**SESSION : MO/2023**

**SUBJECT: EC201 ELECTRONIC DEVICES**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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			CO	BL
Q.1(a)	Explain the concept of negative differential resistance in Gunn diodes. Give the applications of Gunn diodes in electronic circuits and communication systems.	[5]	CO1	3,2
Q.1(b)	Describe how the Hall coefficient and carrier mobility vary with temperature. Discuss the fundamental principles behind the Hall effect in semiconductors.	[5]	CO1	2,2
Q.2(a)	An abrupt Si p-n junction ( $A = 10^{-4} \text{ cm}^2$ ) at 300 K has properties such as $N_a = 10^{17} \text{ cm}^{-3}$ , $N_d = 10^{15} \text{ cm}^{-3}$ , $\tau_p = 10 \mu\text{s}$ , $\mu_p = 450$ , $\tau_n = 0.1 \mu\text{s}$ , $\mu_n = 700$ . The junction is forward biased by 0.5 V. Calculate the forward current? What is the current at a reverse bias of -0.5 V?	[5]	CO2	4,4
Q.2(b)	Define the continuity equation in the context of carrier transport in semiconductors. How does the continuity equation account for carrier generation, recombination, and transport?	[5]	CO2	2,3
Q.3(a)	Discuss the differences between avalanche breakdown and Zener breakdown.	[5]	CO3	2
Q.3(b)	Explain the tunneling process in a tunnel diode. How does the tunneling effect lead to the unique characteristics of a tunnel diode?	[5]	CO3	3,3
Q.4(a)	Explain the fundamental principles of BJT operation. Discuss the roles of majority and minority carriers in BJT operation.	[5]	CO4	3,2
Q.4(b)	Define base narrowing in a BJT. Discuss the factors that contribute to base narrowing.	[5]	CO4	2,2
Q.5(a)	Explain the fundamental operation of a Junction Field-Effect Transistor (JFET). Discuss how the voltage applied to the gate terminal controls the current flow between the source and drain terminals.	[5]	CO5	3,2
Q.5(b)	Explain the fundamental principles of operation for both BJT and MOSFET. Compare and contrast how each device controls the flow of current between its terminals.	[5]	CO5	3,2

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