

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)  
ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination  
Course No.: EEE 6199  
Course Title: Solid State Devices

Winter Semester, A.Y. 2022-2023  
Time: 90 Minutes  
Full Marks: 75

There are 4 (four) questions. Answer any 3 (three) questions. All questions carry equal marks. Marks in the margin indicate full marks. Do not write on this question paper.

- 1. a) Briefly describe the Reverse Recovery Time for a diode. 06
- b) With proper diagrams discuss about the different types of resistance levels considered for *p-n* junction diode. 09
- c) Describe the conditions established by zero bias, forward bias and reverse bias modes of a *p-n* junction diode and how the resulting current is affected. (Draw necessary diagrams) 10
- 2. a) In solid-state device fabrication, what is the purpose of Lithography? With proper diagrams describe the steps of Lithography process needed to form the following pattern in the SiO<sub>2</sub> layer as shown in Fig. 1. 15



Fig. 1

- b) What do you understand by dry and wet oxidation? For both dry and wet oxidation, show the variation of oxide thickness with respect to oxidation time in case of (100) silicon surface on the same graph. 10
- 3. a) With neat diagrams describe the steps involved in the fabrication of a *p-n* junction diode. 15
- b) With neat diagrams describe the construction and working principle of *p-i-n* photodiode. 10
- 4. a) How can you categorize semiconductor photodevices? What are the different categories? 05
- b) Sketch the *I-V* characteristics of a *p-n* junction solar cell. Define what is meant by short-circuit current, open circuit voltage and maximum power rectangle of a solar cell with necessary equations. 10
- c) Write some applications of optoelectronic diodes. 05
- d) What do you understand by spectral response and frequency response of an optoelectronic device. 05