Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	MICROFABRICATION
COURSE CODE	:	BEJ 43203
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JULY / AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER ALL QUESTIONS
		2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**.
		3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) Lithography is the process of transferring the geometrical pattern form a mask to the silicon wafer.

(i) Clearly explain the above statement using appropriate diagram.

(5 marks)

(ii) As a student, you need to carry out photolithography process to produce pattern shown in **Figure Q1(a)(ii)**. Select the photoresist and design a suitable mask.

(7 marks)

(iii) Discuss the reason for your mask design in part **Q1(a)(ii)**.

(3 marks)

(b) **Figure Q1(b)** shows the resist profile effect during photolithography process. Analyse the type of photoresist used and explain the output result.

(6 marks)

(c) Analyse **TWO (2)** parameters that affect the thickness during photolithography process.

(4 marks)

Q2 (a) Doping is a process where an exact amount of impurities/dopant atoms is introduced into the semiconductor (Si) material under specific process conditions.

(i) Identify **TWO (2)** types of doping technique.

(4 marks)

(ii) Compare both technique stated in part **Q2(a)(i)** in terms of properties and doping profile. Support your answer with approriate diagram. Summarize your answer in table.

(8 marks)

(b) As a final year project task, you need to prepare a doped Silicon thin film. Design your experimental set up including type of dopant, doping technique, experimental process, and related apparatus. Support your answer using appropriate diagram.

(13 marks)

Q3 (a) Etching is a process that removes materials from the wafer surface to achieve the IC design requirements.

(i) List and explain **TWO (2)** types of etching processes.

(4 marks)

(ii) Analyse the differences between the two etching types stated in part **Q3(a)(i)**.

(6 marks)

(b) Polysilicon etched depth in chlorine plasma is given in **Table 1**. Plot the graph of etching depth versus time and based on the graph, analyse the etch rate.

(8 marks)

(c) Zinc Oxide (ZnO) was deposited on Silicon (Si) wafer. Calculate the selectivity of ZnO to Si if the etching rate of ZnO and Si is 600 Å/min and 30 Å/min, respectively.
(7 marks)

Q4 (a) You are assigned a project task where you need to deposit metal part on your device. Consider the following steps in order to complete your project.

(i) Select technically good material for your metal part and justify your answer.
(4 marks)

(ii) Propose an appropriate technique to deposit your electrode stated in part **Q4(a)(i)**.
(2 marks)

(iii) Analyse **TWO (2)** advantages of the selected method in **Q4(a)(ii)** compared with the other techniques.
(4 marks)

(iv) Explain step-by-step of your process flow with the aid of apparatus diagram.
(5 marks)

(b) In a laboratory assignment, you are required to measure the roughness of Silicon dioxide film.

(i) Propose **ONE (1)** technique to measure the roughness.
(4 marks)

(ii) Briefly explain about the method properties of the technique in part **Q4(b)(i)** with the aid of diagram.
(6 marks)

- END OF QUESTIONS -

FINAL EXAMINATION

SEMESTER / SESSION : SEM II 2022/2023 PROGRAMME CODE : BEJ
COURSE NAME : MICROFABRICATION COURSE CODE : BEJ 43203

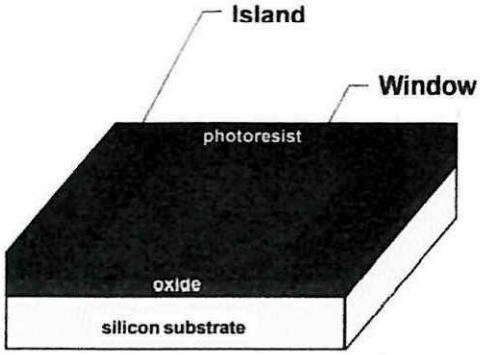

Figure Q1(a)(ii)

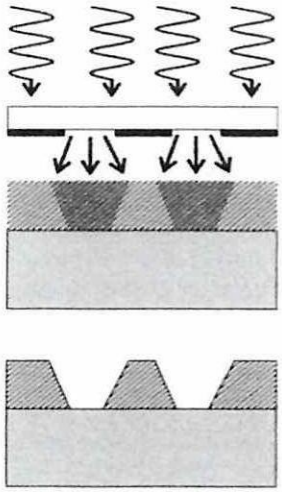

Figure Q1(b)

Table 1

Time (s)	Depth (nm)
10	20
30	50
50	100
70	130