UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	IC PACKAGING
COURSE CODE	:	BEJ 43503
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 **SIX (6)** PAGES

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Q1 (a) Electronics products such as cell phone, fax machine, microwave oven, computer and calculator are based on Microsystem Technologies.

(i) Define the term of Microsystems.

(2 marks)

(ii) Give **FOUR (4)** evolution waves in Microsystem Technologies.

(4 marks)

(iii) Match **FOUR (4)** analogy between human body and electronic packaging as depicted in **Figure Q1(a)**.

(4 marks)

(b) With the aid of a diagram, explain the processes involved in die cutting to system assembly process.

(4 marks)

(c) Packaging is needed in all IC, which are classified into Through-Hole Technology (THT) and Surface Mount Technology (SMT). Both packages have their own unique packaging process flow.

(i) Elaborate the processes in SMT.

(4 marks)

(ii) Discuss in detail the differences between THT and SMT.

(2 marks)

Q2 Wire bonding is the process of providing an electrical connection between the silicon chip and the external leads of the semiconductor device using very fine bonding wires.

(i) With the aid of diagram, discuss the bonding sequence of wire bonding process

(12 marks)

(ii) Sketch and label the ball/wedge connection.

(2 marks)

(iii) Sketch and label the ball/ball connection.

(2 marks)

(iv) Explain **FOUR (4)** process parameters in the wire bonding process.

(4 marks)

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Q3. Microvias are used as the interconnects between layers in high density interconnect (HDI) substrates and printed circuit boards (PCBs) to accommodate the high input/output (I/O) density of advanced packages.

(i) List **THREE (3)** technologies involved in Microvia process

(6 marks)

(ii) Sketch and explain all technologies in **Q3(a)(i)**

(8 marks)

(iii) Identify the type of microvias in **Figure Q3(a), Q3(b) and Q3(c)**.

(6 marks)

Q4 (a) Encapsulation and sealing are two major protecting functions of IC packaging. Explain the purpose of the encapsulation process.

(4 marks)

(b) The encapsulation provides both chemical and mechanical protection of IC, because of that a reasonable life expectancy can be achieved under field conditions in automotive, telecommunications, computer, consumer, medical and other industries.

(i) Discuss the effect of encapsulation on the performance of electronic packaging.

(6 marks)

(ii) Differentiate between hermetic and non-hermetic material.

(4 marks)

(iii) State the effect of encapsulation on the performance of electronic packaging.

(2 marks)

(iv) Describe chemical protection of IC.

(4 marks)

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Q5 (a) As 5G, AI, and high-performance computing continue to make inroads into our world, there's escalating demand for semiconductor devices that deliver enhanced performance, lower latency, increased bandwidth and power efficiency. 2.5D & 3D technologies deliver that and more.

(i) Define 2.5D and 3.0 D IC packaging

(4 marks)

(ii) Discuss the benefits of 2.5D and 3.0D

(6 marks)

(b) High-temperature operating life (HTOL) is a reliability test applied to integrated circuits (ICs) to determine their intrinsic reliability. This test stresses the IC at an elevated temperature, high voltage and dynamic operation for a predefined period of time.

(i) Explain High-temperature operating life (HTOL)

(4 marks)

(ii) Describe the process of HTOL

(6 marks)

- END OF QUESTIONS-

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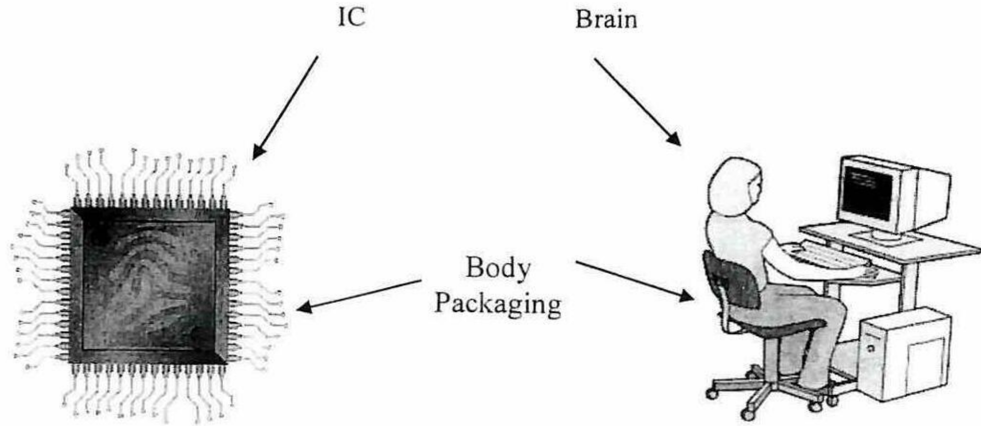

Figure Q1(a)

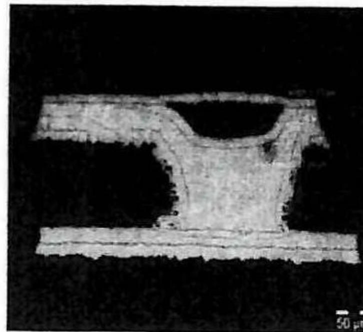

Figure Q3(a)

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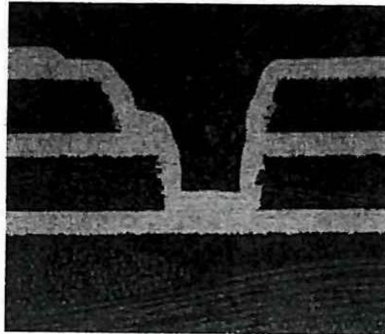

Figure Q3(b)

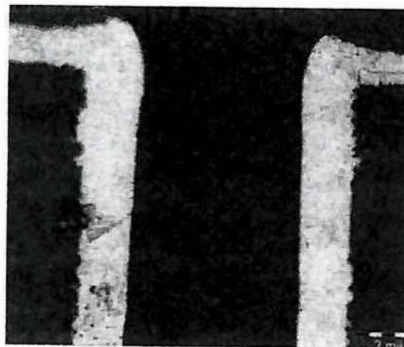

Figure Q3(c)

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