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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021**

COURSE NAME : IC PACKAGING
COURSE CODE : BED 41103
PROGRAMME CODE : BEJ
EXAMINATION DATE : JULY 2021
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS
OPEN BOOK EXAMINATION

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

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- Q1** (a) Microsystems and the technologies they constitute are building blocks of information technology. These systems require a set of fundamental technologies that include not only microelectronics but also photonics, MEMS, RF and wireless. For these functions to be integrated into systems, they have to be designed, fabricated, tested, cooled and reliability assured. In other words, they have to be system-packaged
- (i) Define microsystems. (2 marks)
 - (ii) Name **FOUR (4)** microsystem technologies. (4 marks)
 - (iii) Microelectronics systems involve Integrated Circuit (IC), Systems and Packaging. Explain:
 - a. Integrated Circuit (IC)
 - b. Systems
 - c. Packaging(3 marks)
- (b) IC assembly is the first processing step after wafer fabrication and singulation that enables ICs to be packaged for systems use.
- (i) Describe IC assembly. (4 marks)
 - (ii) Explain the purpose of IC assembly (4 marks)
 - (iii) Analyze the function of IC assembly (3 marks)
- Q2** (a) Wire bonding is the process of providing electrical connection between the silicon chip and the external leads of the semiconductor device using very fine bonding wires.
- (i) Using 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 wirebonding process. (4 marks)

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- Q3** (a) Tape Automated Bonding (TAB) has been developed in early 1970s, which is applied to variety of consumer, medical, security computer, peripheral, telecommunication, automotive and aerospace products:
- (i) Define Tape Automated Bonding (TAB) (2 marks)
 - (ii) Sketch and label the schematic of Inner and Outer Lead Bonding (8 marks)
 - (iii) Explain the process in **Q3(a)(ii)**. (8 marks)
 - (iv) Discuss **FOUR (4)** the advantages and disadvantages of TAB (2 marks)
- Q4** (a) Failure mechanisms in an electronic product are major problem in production line. They are caused by thermo-mechanical, electrical, chemical and environmental mechanisms. Analyse **FIVE (5)** fundamentals of thermo-mechanical reliability. (10 marks)
- (b) The symptoms of failure in electronic devices are always observed at the system level. Understanding the mechanism that causes components failure is the key to make reliable microelectronic package.
- (i) Components are connected to the printed wiring boards (PWBs) by an array of relatively larger solder balls. Name one of the technique nowadays. (1 mark)
 - (ii) State **THREE (3)** failure mode mechanisms. (3 marks)
 - (iii) Explain in detail the failure mechanisms in **Q4(b)(i)**. (6 marks)

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- Q5** (a) Encapsulation and sealing are two major protecting functions of IC packaging. They are used to protect IC devices from adverse environmental and mechanicals effect. Encapsulation processes can be classified into two major categories: moulding and liquid encapsulation.
- (i) Define encapsulation and sealing process. (4 marks)
 - (ii) Explain the process of moulding and liquid encapsulation. (6 marks)
- (b) Encapsulation provides both chemical and mechanical protection of IC, such that a reasonable life expectancy can be achieved under filed conditions in automotive, telecommunications, computer, consumer, medical and other industries. Encapsulation also can be considered as the middle process in IC packaging.
- (i) Discuss the effect of encapsulation on the performance of electronic packaging. (2 marks)
 - (ii) Describe chemical protection of IC. (8 marks)

- END OF QUESTIONS -

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