

Sample

DORSET INSTITUTE OF HIGHER EDUCATION

In Conjunction with

INSTITUTE OF CIRCUIT TECHNOLOGY

PRINTED CIRCUIT TECHNIQUES

Examination (1978)

Attempt SIX Questions

Date: Thursday, 27th April, 1978

Time: 1.30 - 4.30 p.m.

1. Outline briefly the raw materials used and the manufacturing processes involved in the production of copper clad epoxy glass laminate for printed circuit production.
2. (a) State briefly the reasons for opting for a double-sided layout as against single-sided.
 (b) Explain how mechanical layout is an aid to the P.C. designer.
 (c) State the importance of reduction bars and accurate scale.
3. (a) Describe and explain five requirements of a photographic emulsion suitable for making P.C. master negatives.
 (b) Describe the two colour technique for producing negatives for a double-sided board, explaining the advantages of the system.
4. (a) State the necessary environmental conditions for processing dry film.
 (b) Name the surface preparation most commonly used and how to control this process.
 Also give the test indicating clean copper.
 (c) What is the purpose of a laminator? Name the detrimental factors involved during lamination.
 (d) Why are hold times necessary after lamination and exposure?
 (e) What is collimation? Describe why a Stouffer test is necessary for correct exposure.
- 5.(a) It is generally accepted that in order to produce a sound Plated Through Hole, the holes must be drilled with the walls neither too rough or too smooth.

Name two factors which are of prime importance, i.e. configuration of twist drill, and what parameters one should look for in a drilling machine.

5(b) Explain briefly how the following aspects improve productivity and accuracy of N.C. drilling:

- (i) Computer control
- (ii) Machine structure - mechanical
- (iii) Machine positioning

6. Multilayer printed circuits are becoming more and more specified for use in professional electronic systems. Answer Part A and either Part B or Part C.

Part A

Briefly outline the need for multilayer boards based on the designer's requirement.

Part B

Drilling of multilayer boards is more critical than with doublesided boards. Give the reasons and discuss some of the manufacturing techniques prior to Through Hole Plating.

Part C

Give some reasons why the lamination cycle is critical during the multilayer process and briefly describe the lamination operation.

7. Upon receipt of a customer's artwork and machining drawing, various checks are necessary. Describe and explain five checking points.

8. (a) Define Quality Assurance, Quality and Quality Control.
(b) With whom does the responsibility for quality of a product lie?
(c) Describe a scheme for deriving the cost of rejects in the production of print and etch printed wiring boards. The cost at a particular process/inspection stage may be related to:

- (i) labour cost
- (ii) manufacturing cost
- (iii) cost of output
- (iv) sales cost

(d) Select that which is most suitable and give reasons for your choice.
Mark on the attached diagrams the possible inspection/quality control stages.

9. Outline the steps used in the Through Hole Plating of printed circuit boards. Indicate where possible:

- (a) the critical areas of the process
- (b) chemical control necessary
- (c) equipment required for any part of the process.

wer
) and (b)
) or (d)

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10. (a) Using illustrative sketches, define the following terms:
- (i) Etch Factor
 - (ii) Undercut
 - (iii) Overhang
- (b) Tabulate 2 advantages and 2 disadvantages of each of the following in P.C.B. work:
- (i) ammoniacal etchant
 - (ii) ammonium persulphate
 - (iii) auto dosing in spray etch equipment
- (c) Sketch the phase diagram for a binary mixture of tin and lead. Use the diagram to deduce the plating alloy coating most suitable for a fused finish on a P.C.B. and comment briefly concerning the effect of changing by $\pm 10\%$ of lead concentration.
11. Detail four reasons for using gold plating on edge connectors. Describe the process of gold plating giving indication of what parameters must be controlled.
- Describe briefly how plating thickness and porosity tests are carried out.
12. Describe the preparation of the three main types of photographic stencils used in the screen process printing industry today and their main attributes.