

DAVID GREAVES
COLLECTION

CST1/1

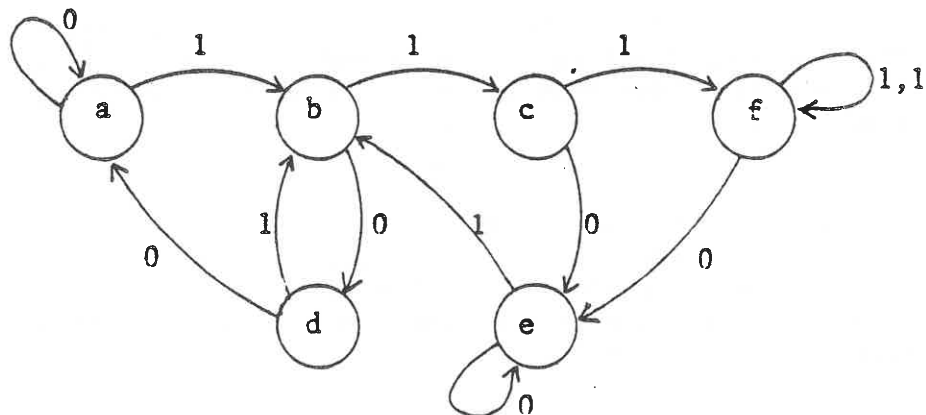
COMPUTER SCIENCE TRIPOS

Thursday 2 June 1977. 9 to 12

PAPER 1

Candidates should answer five questions

1. What is the purpose and value of state reduction for a sequential machine? Outline a method for doing it and comment on the probable effects it would have on the implementation of a machine whose initial specification is given below.



2. Explain in detail the function of the BUSY and DONE flip-flops in NOVA standard peripherals. How are they set and sensed by program?

TURN OVER

3. Give all the circumstances in which instructions obeyed in an IBM/370 computer are not taken from successive storage locations, paying particular attention to the action of the hardware when an interrupt occurs.

Describe the hardware features that allow the interrupt handlers to use facilities denied to the problem programmer.

4. Describe the functions of *segment* and *page* tables in a paged virtual memory system, paying special attention to control of access and to the sharing of pages. State what is meant by *thrashing* and indicate some of the measures that may be taken to control it.

5. At which stages should character-code translation to and from a standard internal code be made in a computer system? Why is this a live question after 28 years of practical computation?

6. In Algol W, quantities of type *procedure* or *array* may be passed as arguments in procedure calls but may not be assigned to variables. By considering the implications of extending the language to allow procedure and array variables, explain why this restriction was made.

7. Many modern computer programming languages have data structuring facilities, similar to those of Algol W, that may be used to construct complex objects such as lists and re-entrant trees. What are the fundamental linguistic primitives required for such a facility? Outline a possible run-time implementation noting any features which are inherently inefficient.

8. What is the programmer's notion of a vector? Give examples of how vectors may be represented in a computer, and indicate the purposes for which each representation may be useful.

9. Describe an algorithm for finding the minimum spanning subtree of a graph. Why does it work, and what is its relation to wiring problems in computer construction?

10. What is the common factor between 'sorting digit-by-digit from the most significant end' and 'Quicksort'? Would you recommend either as a practical workhorse library subroutine? Give reasons.