COMPUTER SCIENCE TRIPOS Part IB − 2021 − Paper 5
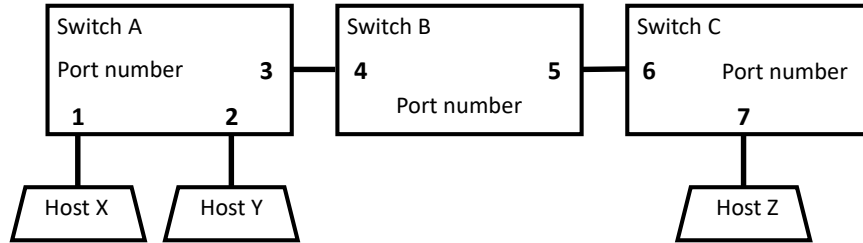
4 Computer Networking (awm22)

(*a*) Consider the layer-2 switch topology shown below.

Assuming all switches start with empty switch-forwarding tables; Host X (with physical address X) sends a packet destined for Host Z. Enumerate in the style below, all packets sent across the network until the message arrives at Host Z. You may assume packet-processing, latency and transmission time are negligible. Additionally, indicate packets transmitted simultaneously.   [5 marks]

Time Step	Sent by Device	on Link	Frame Source	Destination
0	X	X-A1	X	Z
⋮	⋮	⋮	⋮	⋮
?	C	C7-Z	X	Z

(*b*) Enumerate in the style below, the forwarding table of Switch B at the end of Part (a).

Destination	Port
⋮	⋮

[2 marks]

(*c*) Consider a layer-2 network consisting of S+1 switches, S directly attached to H hosts. Each host runs V virtual machines, each with a single address. S switches are connected using a star topology with a single switch C at the centre. Each host exchanges data with a selected and stable subset of other hosts.

Estimate the worst case number of entries in the forwarding table for any typical switch S and the number of entries in the forwarding table for switch C.

[3 marks]

(*d*) Users of this cluster of machines complain of occasional misbehaviour attributed to network timeouts and network slowdown.

Outline two plausible chains of events causing the problem. Describe two appropriate, cost-effective, strategies for overcoming the issues faced by the users. You may assume the switches are state-of-the-art and buying more hosts is not the answer.   [10 marks]