COMPUTER SCIENCE TRIPOS Part II – 2019 – Paper 8

12 Principles of Communications (jac22)

(*a*) The Border Gateway Protocol (BGP) uses attributes to enforce transit relationships for Outbound route filtering, and to enforce the order of route preference between customers, peers and providers.

Key attributes, in precedence order, are as follows (from highest to lowest):

- Highest Local Preference

- Shortest ASPATH

- Lowest MED

- i-BGP < e-BGP

- Lowest IGP cost to BGP egress

- Lowest router ID

Discuss the basic use of the relevant BGP mechanisms and their use of attributes for backup and for traffic engineering.

(*i*) Explain the different attributes.

(*ii*) Explain the mechanisms that are used to determine paths within an AS.

(*iii*) Explain the mechanisms that are used to determine paths between ASs.

[5 marks each]

(*b*) BGP announces and withdraws prefixes between Autonomous Systems so that different domains can route traffic amongst themselves. The dynamics of BGP advertisements can be impacted by intra-domain routing, so that if a route flaps, for example because of an intermittent fault on a link or router, this can be exported to the whole Internet. Simple techniques of fixing an interval for advertisements, and *punishing* routers that exceed that rate have been proposed.

Describe very briefly how one might use a control theoretic approach to provide stable damping of this effect dynamically, and possibly, more efficiently.

[5 marks]