BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

BSc HONS DEGREE IN INFORMATION TECHNOLOGY

NWE403/IT401 : VIRTUAL PRIVATE NETWORK

2 HOURS 30 MINUTES Total marks are 100

INSTRUCTION TO CANDIDATES

Answer **all** questions.

QUESTION 1

a. Explain how a cost-conscious business with multiple sites might benefit from using the Internet as a public network to provide WAN connectivity between its sites. Detail the technical considerations, technologies and security operation necessary to utilise this option. **[9]**

b. Explain how techniques such as MPLS can be used on existing and future large-scale networks to improve packet delivery and routing efficiency. Use supporting diagrams to describe how MPLS can be overlaid on conventional networks to deliver the perceived benefits. **[9]**

QUESTION 2

a. Briefly explain the security concepts of Confidentiality, Authentication, Data Integrity and Availability. **[8]**

b. All security threats are divided into four broad classes: **Disclosure, Disruption, Deception** and **Usurpation**. Discuss these threats and give an example of each. **[8]**

QUESTION 3

While IPsec is a protocol, it is also a framework that provides many choices to people configuring an IPsec connection. The framework does not lock one into a certain encryption algorithm, hashing algorithm, or authentication mechanism. Depending on the choice of components that are part of the IPsec protocol suite, you can get several different security services.

a. Discuss IPsec protocols and delivery modes (IKE, ESP, AH, tunnel mode, transport mode) **[15]**

b. Describe hairpinning, split tunneling, always-on, NAT traversal **[12]**

QUESTION 4

Describe the following layer 2 VPN tunneling protocols

i. PPTP; **[5]**

ii. L2F; and **[4]**

iii. L2TP **[5]**

QUESTION 5

A company has an office based in Harare with a network that houses two web servers. One of these web servers is designed for external access, the other is an intranet web server designed only to be accessible to employees of the company. The company also has another office located in Maputo, which is externally connected to the Harare office through a virtual private network routed over the public internet. This virtual private network must always be active, and not raised on demand by individual members of staff in the Maputo office.

Both offices continue to use IP version 4 addresses, but the company only has a single public IP address range of 200.10.10.0/26. They require more nodes than the 62 allowed by this range, and so all nodes in the networks are numbered with private addresses from the 10.0.0.0/8 range.

Describe, with the aid of a diagram, a network topology that will interconnect the two offices and that will also allow public access to the external facing web server. You must clearly identify all routing or switching components required, and label IP

addresses and subnets for at least one node in Maputo, one node in Harare and all other identified components. Use Classless Internet Domain Routing (CIDR) notation to label the subnets. The diagram should also indicate how the routing of private addresses to the Internet is achieved, and the function of the relevant components should be described. **[25]**

****** END OF EXAM******