

NAME: _____

STUDENT ID: _____

SIGNATURE: _____

THE UNIVERSITY OF NEW SOUTH WALES

Session 2, 2008

TELE 9752

Network Operations and Control – Examination 1

Materials: You may bring writing and drawing instruments to the exam. You may not bring any other materials.

Print your name and student number, and sign, on the top right hand corner of this page.

You have 10 minutes reading time plus 60 minutes writing time for this exam.

This exam consists of 16 questions.

You should attempt all questions

The maximum number of marks for each question is shown in brackets before the question, e.g. [2].

The sum of all marks for all questions is 50

Questions generally appear in the order in which topics were covered in the course.

Sections group together questions that relate to a single topic, and section headings indicate the total marks available for questions in that section.

You must return this exam paper with your answer booklet.

You are allowed to smile.

You might need to consult the following reference material:

Numeric codes for common ASN.1 types:

02 INTEGER

04 OCTET STRING

06 OBJECT IDENTIFIER

05 NULL

16 SEQUENCE / SEQUENCE OF

[11] Section 1: Network Management Systems

1. [5] What are the 5 functional areas for managing OSI networked systems?
2. [6] What is the difference between an element, an object and an agent, in the context of network management?

[13] Section 2: Revisiting protocol stacks in context of management

3. [2] What feature is introduced to many protocol reference models to enable a network management system to have direct access to each layer?
4. [2] Give two examples of protocols that implement loopback functions in order to facilitate network testing.
5. [2] What are two advantages of in-band management over out-of-band management?
6. [3] Briefly describe how Time Domain Reflectometry works.
7. [2] When a switch has been configured so that each of its ports belongs to a different VLAN, then will frames that are broadcast from one port be directly received (through the switch) on any other port?
8. [2] Why might a network operator block or limit the flow of ICMP traffic?

[11] Section 3: Structuring and presenting management information

9. [2] The TCP MIB [RFC 4022] includes the following:

```
tcpCurrEstab OBJECT-TYPE
    SYNTAX      Gauge32
    DESCRIPTION
        "The number of TCP connections for which the current state
         is either ESTABLISHED or CLOSE-WAIT."
    ::= { tcp 9 }
```

Why is this object defined as a Gauge rather than a Counter?

10. [6] The TCP MIB [RFC 4022] defines a table of sockets that are being used for listening:

```
tcpListenerTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF TcpListenerEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    ::= { tcp 20 }

    tcpListenerLocalAddressType ... ::= { tcpListenerEntry 1 }
    tcpListenerLocalAddress ... ::= { tcpListenerEntry 2 }
    tcpListenerLocalPort ... ::= { tcpListenerEntry 3 }
    tcpListenerProcess ... ::= { tcpListenerEntry 4 }

tcpListenerEntry OBJECT-TYPE
    SYNTAX      TcpListenerEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    INDEX      { tcpListenerLocalAddressType,
                tcpListenerLocalAddress,
                tcpListenerLocalPort }
    ::= { tcpListenerTable 1 }

TcpListenerEntry ::= SEQUENCE {
    tcpListenerLocalAddressType      InetAddressType,
    tcpListenerLocalAddress          InetAddress,
    tcpListenerLocalPort             InetPortNumber,
    tcpListenerProcess               Unsigned32
}
```

- a. [2] Why is the table object tcpListenerTable defined as being “not-accessible”?
- b. [2] What is the purpose of the STATUS clause?
- c. [2] Write an OID that potentially identifies the port number of a particular listener entry. The OID will start with “tcpListenerTable.” followed by a dot-separated string of integers or values of the form <character><digit> where:
 - InetAddressType can have values T1, T2, T3...
 - InetAddress can have values A1, A2, A3, ...
 - InetPortNumber can have values P1, P2, P3, ... and
 - Unsigned32 can have values U1, U2, U3...

11. [3] What are the three pieces of information that determine the types of access (e.g. read, write or create) that a particular manager is permitted to make to a managed object through SNMPv1?

[15] Management protocols

12. [2] Write the sequence of bytes that would be used to transmit the decimal integer 9752 using Basic Encoding Rules. You can show the value of each byte in hexadecimal; $9752 = 0x2618$ in hexadecimal.

13. [2] What transport protocol does SNMP typically use?

14. [2] What functions does SNMPv2 add that go beyond the functionality of SNMPv1?

15. [2] What advantage do SNMP Traps provide over a manager polling the agent to determine whether the value of an object has changed?

16. [7] RFC 2011 defines an ipAddrTable as:

```

ipAddrTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF IpAddrEntry
    ::= { ip 20 }
ipAddrEntry OBJECT-TYPE
    SYNTAX      IpAddrEntry
    INDEX       { ipAdEntAddr }
    ::= { ipAddrTable 1 }
IpAddrEntry ::= SEQUENCE {
    ipAdEntAddr      IpAddress,
    ipAdEntIfIndex   INTEGER,
    ipAdEntNetMask   IpAddress,
    ipAdEntBcastAddr INTEGER,
    ipAdEntReasmMaxSize INTEGER
}
ipAdEntAddr OBJECT-TYPE
    SYNTAX      IpAddress
    ::= { ipAddrEntry 1 }
ipAdEntIfIndex OBJECT-TYPE
    SYNTAX      INTEGER (1..2147483647)
    ::= { ipAddrEntry 2 }
ipAdEntNetMask OBJECT-TYPE
    SYNTAX      IpAddress
    ::= { ipAddrEntry 3 }
ipAdEntBcastAddr OBJECT-TYPE
    SYNTAX      INTEGER (0..1)
    ::= { ipAddrEntry 4 }
ipAdEntReasmMaxSize OBJECT-TYPE
    SYNTAX      INTEGER (0..65535)
    ::= { ipAddrEntry 5 }

```

where the OID of ipAddrEntry is 1.3.6.1.2.1.4.20.1. An instance of an ipAddrTable has values shown in the table below (from Subramanian):

Row	ipAdEntAddr	ipAdEntIfIndex	ipAdEntNetMask	ipAdEntBcastAddr	ipAdEntReasmMaxSize
1	123.45.2.1	1	255.255.255.0	0	12000
2	123.45.3.4	3	255.255.0.0	1	12000
3	165.8.9.25	2	255.255.255.0	0	10000
4	9.96.8.138	4	255.255.255.0	0	15000

a. [2] What is the OID of the IpAdEntNetMask object that has the value 255.255.0.0? You can start your OID with “ipAddrEntry.” to avoid writing out the prefix “1.3.6.1.2.1.4.20.1”

b. [5] If GetNext was repeatedly applied to this table, starting with the OID of ipAddrEntry., then what would be the first 5 values returned in get responses?