



UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF MASTERS DEGREE IN COMPUTER SCIENCE

COSC 821: COMPUTER NETWORKS DESIGN AND MANAGEMENT

STREAMS: MSC. COMP. SCI (Y1S1)

TIME: 3 HOURS

DAY/DATE: TUESDAY 06/04/2021

2.30 P.M. – 5.30 P.M.

INSTRUCTIONS

- Attempt **Question ONE (Section A)** and any other **TWO** from **Section B**
- Marks are awarded for clear and concise answers

SECTION A-COMPULSORY

QUESTION ONE [30 MARKS]

(a) The figure below shows a packet captured and analyzed by Wireshark. Study it and provide the following information.

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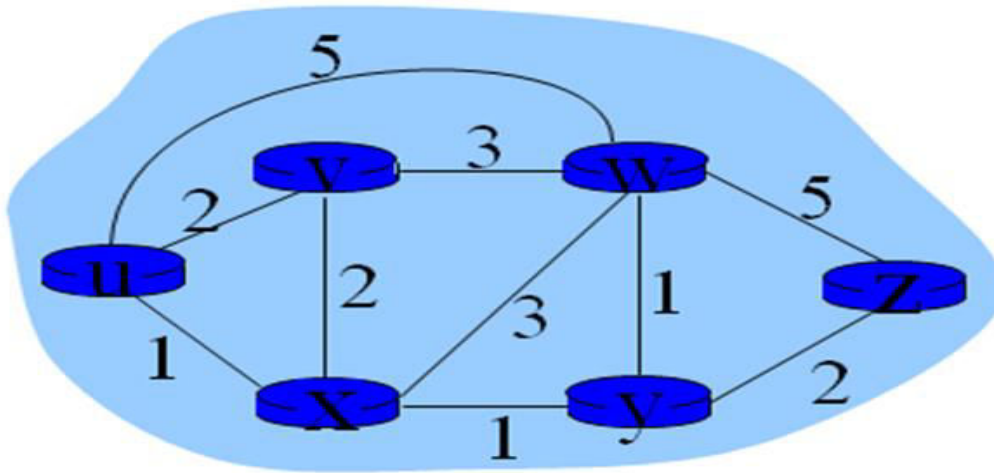
Frame 2: 110 bytes on wire (880 bits), 110 bytes captured (880 bits)
Ethernet II, Src: AsrockIn_a6:d1:29 (bc:5f:f4:a6:d1:29), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
  Destination: Broadcast (ff:ff:ff:ff:ff:ff)
    Address: Broadcast (ff:ff:ff:ff:ff:ff)
      ....01. .... = LG bit: Locally administered address (this is NOT the factory default)
      ....01. .... = IG bit: Group address (multicast/broadcast)
  Source: AsrockIn_a6:d1:29 (bc:5f:f4:a6:d1:29)
    Address: AsrockIn_a6:d1:29 (bc:5f:f4:a6:d1:29)
      ....00. .... = LG bit: Globally unique address (factory default)
      ....00. .... = IG bit: Individual address (unicast)
  Type: IP (0x0800)
Internet Protocol Version 4, Src: 192.168.2.147 (192.168.2.147), Dst: 192.168.2.255 (192.168.2.255)
  Version: 4
  Header length: 20 bytes
  Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00: Not-ECT (Not ECN-Capable Transport))
  Total length: 96
  Identification: 0x0006 (6)
  Flags: 0x00
  Fragment offset: 0
  Time to live: 128
  Protocol: UDP (17)
  Header checksum: 0xb3a4 [correct]
  Source: 192.168.2.147 (192.168.2.147)
  Destination: 192.168.2.255 (192.168.2.255)
  [Source GeoIP: Unknown]
  [Destination GeoIP: Unknown]
User Datagram Protocol, Src Port: netbios-ns (137), Dst Port: netbios-ns (137)
  Source port: netbios-ns (137)
  Destination port: netbios-ns (137)
  Length: 76
  Checksum: 0x6395 [validation disabled]
NetBIOS Name Service
0000 11111111 11111111 11111111 11111111 11111111 11111111 10111100 01011111
0008 11110100 10100110 11010001 00101001 00001000 00000000 01000101 00000000
0010 00000000 01100000 00000000 00000110 00000000 00000000 10000000 00010001

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- (i) The transport layer protocol used to carry the packet [2 Marks]
- (ii) The destination IP address of the packet [2 Marks]

- (iii) The destination port of the packet [2 Marks]
- (iv) The TTL of the packet [2 Marks]
- (v) The source MAC address of the packet [2 Marks]

- (b) The figure below shows an arrangement of routers in a certain area. Using Dijkstra algorithm, compute the shortest path and the cost from u to z [6 Marks]



- (c) Discuss **THREE** Key issues in the use of network measurement tools [6 Marks]
- (d) Network Measurement Experiments are divided into two major categories: Live measurements and Controlled-traffic measurements.
  - (i) Give a clear distinction between these approaches [4 Marks]
  - (ii) Give one strength and one limitation of each approach [4 Marks]

**SECTION B: ANSWER ANY TWO QUESTIONS**

**QUESTION TWO [15 MARKS]**

- (a) Researchers utilize knowledge about the interactions of network components to understand and explain the workings of a computer network via a conceptual models. Briefly describe the Salient features of the following models.
- (i) Analytic models [3 Marks]
  - (ii) Simulation Models [3 Marks]

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- (b) Consider a router that interconnects three subnets: X, Y, and Z. Suppose all of the interfaces in each of these subnets are required to have the prefix 13.2.80.0/21. Suppose subnet X is required to support 1000 interfaces, and subnets Y and Z are each required to support 500 interfaces. Compute network addresses for X, Y and Z to satisfy these constraints **[9 Marks]**

### QUESTION THREE [15 MARKS]

- (a) Differentiate between bandwidth and throughput **[4 Marks]**
- (b) Explain **THREE** approaches of decreasing traffic to reduce congestion in computer Networks **[6 Marks]**
- (c) Ten components are used to backup a component whose reliability is 0.95. Determine the overall reliability of the system **[5 Marks]**

### QUESTION FOUR [15 MARKS]

Compare and contrast ethernet (IEEE 802.3) and wireless LAN (IEEE 802.11) in relation to the way they implement the following data link layer issues:

- (i) Media access Control **[5 Marks]**
- (ii) Error handling **[5 Marks]**
- (iii) MAC addressing **[5 Marks]**

### QUESTION FIVE [15 MARKS]

- (a) Network management involve managing faults, configuration, accounting, performance and security. Briefly highlight key concerns addressed by each **[10 Marks]**
- (b) A flow is defined as a unidirectional series of IP packets with unique source/destination addresses, port numbers (assuming TCP or UDP to be the transport layer protocol) and protocol number. Highlight the key parameters associated to every flow **[5 Marks]**
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