VNU-HCM **HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY** FACULTY OF COMPUTER SCIENCE AND ENGINEERING	**FINAL EXAM PAPER** **SEMESTER 2, YEAR 2018-2019** **Course: Computer Networks** *Time allowed: 90 minutes;* *(60 multiple choice questions)*	
Notes: • *This is a closed book exam. No material is allowed in the exam room* • *The below spaces MUST filled with student name and ID* • *A separate multiple choice answer sheet is provided* • *This paper must be handed in together with the answer sheet*		**0001**

Names:.. Student No: ....

Part I: Fundamental concepts of computer networks

1. When using a full-duplex link, a node can:
   a. Only send data
   b. Only receive data
   c. Send and receive data
   d. Send and receive data concurrently

2. Which part of the Internet consist mostly routers?
   a. Network edge
   b. Access network
   c. Network core
   d. All of the above

3. Suppose there is exactly one packet switch between a sending host and a receiving host. The transmission rates between the sending host and the switch and between the switch and the receiving host are R1 and R2, respectively. Assuming that the switch uses store-and-forward packet switching, what is the total end-to-end delay to send a packet of length L? (Ignore queuing, propagation delay, and processing delay.)
   a. $L/(R1+R2)$
   b. $L/R1 + L/R2$
   c. $(R1 + R2)/L$
   d. $R1/L + R2/L$

4. How long does it take a packet of length 1000 bytes to propagate over a link of distance 2500 km, propagation speed 2.5x10^8 m/s, and transmission rate 2 Mbps?
   a. 10 ms
   b. 14 ms
   c. 4 ms
   d. 8 ms

5. A running dog is carrying a hard drive that contains 21GB of data at the speed of 18 km/h. At what travelling distance the data transfer rate of the dog is higher than 150 Mbps link?
   a. 6 km
   b. 7 km
   c. 8 km
   d. 10 km

6. Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links, of rates R1 = 500 Mbps, R2 = 2 Mbps, and R3 = 1 Mbps. Assuming no other traffic in the network, what is the throughput for the file transfer?
   a. 500 Mbps
   b. 1 Mbps
   c. 2 Mbps
   d. 3.5 Mbps

7. How long will it take to send a file of size 1,280,000 bits from A to B using a TDM link of rate 7.680 Mbps with 24 slots a second? Assuming that the time for setting up the connection can be ignored.
   a. 0.17s
   b. 4s
   c. 10s
   d. 17s

8. Which of the following protocols can detect errors in data packets and resend data packet to recover from errors?
   a. UDP
   b. TCP
   c. IP
   d. Ethernet

Part II: Operating principles of common applications on the Internet

9. Suppose Alice, with a Web-based e-mail account (such as Hotmail or Gmail), sends a message to Bob, who accesses his mail from his mail server using POP3. What are application protocols used in this scenario?
   a. HTTP, SMTP, POP3
   b. HTTP, FTP, IMAP
   c. HTTP, FTP, POP3
   d. HTTP, SMTP, IMAP

10. Consider an HTTP client that wants to retrieve a Web document at a given URL. The IP address of the HTTP server is initially unknown. What application-layer protocol besides HTTP is needed in this scenario?
    a. SMTP
    b. FTP
    c. UDP
    d. DNS

11. To find the route of a packet from your computer to a host in the Internet, which program should be used:
    a. nslookup
    b. ping
    c. ipconfig/ifconfig
    d. tracert/traceroute

12. An attack to DNS could bring down the Internet access because:
    a. The physical connections to all the servers related to the DNS will be down
    b. All the servers related to the DNS will be infected with dangerous viruses

c. TCP service will not be available when the DNS is attacked

d. **Applications will not be able to find the IP addresses of requested servers addressed by domain names**

13. Choose the right application level protocols from:
    a. TCP
    b. UDP
    c. ICMP
    d. **MQTT**

14. DNS application uses which transport protocol(s)?
    a. TCP
    b. UDP
    c. **TCP/UDP**
    d. IP

15. To identify an application on Internet we could use:
    a. IP address of the application
    b. Port number of the application
    c. **A combination of IP address and Port number**
    d. None of above

16. Choose correct statement about SMTP:
    a. SMTP uses UDP as a transport protocol
    b. **User A can send an email using User B's email address as the sender**
    c. Users need to log into SMTP server to send emails
    d. All (a), (b) and (c) are correct

17. FTP application operates on which layer of the Internet:
    a. **Application**
    b. Transport
    c. Network
    d. Data link

18. Why do HTTP, FTP, SMTP, and POP3 run on top of TCP rather than on UDP?
    a. **They all require reliable data transfer**
    b. They accept certain rate of loss of data during transfer
    c. They require certain level of security during data transfer
    d. All (a), (b) and (c) are true

Part III: Principles of TCP an UDP

19. In TCP congestion avoidance mode, after every round trip time, the size of congestion window is:
    a. Cut in half
    b. Doubled
    c. **Increased by 1 MSS**
    d. Set to 1 MSS (Maximum Segment Size)

20. Which of the following services TCP can't provide?
    a. Reliable data transfer
    b. Order data delivery
    c. **Minimum throughput**
    d. No data loss

21. Suppose that Host A sends to Host B 88 bytes of data in a segment having sequence number 92, what is the value of the acknowledgement number (ACK) of the next segment that Host B will send to Host A?

a. 92
c. 181

b. 93
d. 180

22. In order to know whether a TCP segment is a SYN segment, which information should we look at?
    a. Sequence number is 1
    c. SYN flag is on

    b. Acknowledgement number is 1
    d. Acknowledgement flat is on

23. Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110. Suppose that the first segment is lost but the second segment arrives at B. In the acknowledgment that Host B sends to Host A, what is the acknowledgement number?

a. 89 **b. 90** c. 91 d. 110

24. In order to identify exactly a process in the Internet, which of the following can be used:
    a. IP address of the host computer that runs the process
    b. Port number associated with the process
    c. IP address of the process
    d. A combination of the IP address of the host computer that runs the process and the port number associated with the process on the host

25. In Java, class DatagramSocket is used for:
    a. Setting up a TCP connection at both client and server sides
    b. Setting up a TCP connection at client side
    c. Setting up a TCP connection at server side
    d. Creating a UDP Socket

26. In Wireshark, we have a packet with the details as in the figure:

Source	Destination	Protocol	Length	Info
128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=164041 Win=62780 Len=0
128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=164091 Win=62780 Len=0
192.168.1.102	128.119.245.12	TCP	62	1161 → 80 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1
128.119.245.12	192.168.1.102	TCP	62	80 → 1161 [SYN, ACK] Seq=0 Ack=1 Win=5840 Len=0 MSS=1460 SACK_PERM=1
192.168.1.102	199.2.53.206	TCP	62	1162 → 631 [SYN] Seq=0 Win=16384 Len=0 MSS=1460 SACK_PERM=1
192.168.1.102	128.119.245.12	HTTP	104	POST /ethereal-labs/lab3-1-reply.htm HTTP/1.1 (text/plain)

Which of the following statements is correct?
    a. The packet carries a HTTP request to a Web server.
    b. The packet is used to create a TCP connection.
    c. The packet is used to close a TCP connection
    d. This is a broadcast packet

27. Which field of data exists in both UDP and TCP segment?
    a. Sequence number
    b. Acknowledgement number
    c. Header length
    d. Checksum

28. What is the EstimatedRTT if: SampleRTT = 106ms, alpha = 0.125, last EstimatedRTT = 100ms?
   a. 120.99ms **b. 100.75ms** c. 5.06ms d. 103.15ms

esrtt = alpha*sample + beta*prev estt

Part IV: Principles of routing protocols

29. In classless inter-domain routing, given the IP address: 200.23.16.0/22, are there how many bits in the host portion of the subnet?
    a. 9
    b. 10
    c. 23
    d. 24

30. In classless inter-domain routing, given the IP address: 200.23.16.0/23, are there how many bit 1s (one) in the mask?
    a. 9
    b. 10
    c. 23
    d. 24

31. Which of the following algorithms is used by Open Shortest Path First (OSPF)?
    a. Distance vector algorithm
    b. Link state algorithm
    c. Both distance vector and link state algorithms
    d. Both (a) and (b) are wrong

32. Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1.17/24. Also suppose that Subnet 1 is required to support at least 60 interfaces, Subnet 2 is to support at least 90 interfaces, and Subnet 3 is to support at least 12 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints, respectively.
    a. 223.1.17.0/26, 223.1.17.64/25, 223.1.17.192/28
    b. 223.1.17.0/24, 223.1.17.64/24, 223.1.17.192/24
    c. 223.1.17.0/25, 223.1.17.64/25, 223.1.17.192/25
    d. 223.1.17.0/26, 223.1.17.128/25, 223.1.17.64/28

33. Suppose an ISP owns the block of addresses of the form 128.119.40.64/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?
    a. 128.119.40.64/26, 128.119.40.80/26, 128.119.40.96/26, 128.119.40.112/26
    b. 128.119.40.64/27, 128.119.40.80/27, 128.119.40.96/27, 128.119.40.112/27
    c. 128.119.40.64/28, 128.119.40.80/28, 128.119.40.96/28, 128.119.40.112/28
    d. 128.119.40.64/29, 128.119.40.80/29, 128.119.40.96/29, 128.119.40.112/29

34. Consider sending a 2400-byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? (2400-20)/(700-20)
    a. 2
    b. 3
    c. 4
    d. 5

35. Consider the network shown below (used for the next 4 questions). Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol. Suppose eBGP and iBGP are used for the inter-AS routing protocol. Initially suppose there is no physical link between AS2 and AS4.
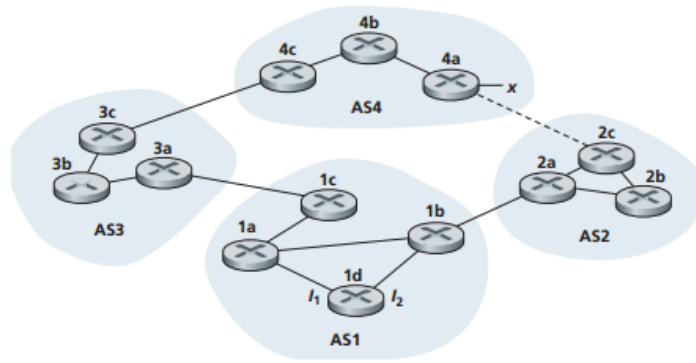
Router 3c learns about prefix *x* from which routing protocol?

    a. OSPF   **c. eBGP**
    b. RIP   d. iBGP

36. Continue with the previous question, Router 3a learns about x from which routing protocol?
    a. OSPF   c. eBGP
    b. RIP   **d. iBGP**

37. In Virtual Circuit networks:
    a. A connection needs to be setup before data can flow   c. Every router on a source-destination path maintains the state of each passing connection
    b. Each data packet carries an identifier   **d. All (a), (b), and (c) are true**

38. Consider a subnet with prefix 128.119.40.128/26. Choose an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network.
    a. 128.119.40.182   c. 128.119.40.202
    b. 128.119.40.192   d. 128.119.40.222

39. Your computer has a private IP address. Which is the network technique that allows your computer to access Internet?
    a. DHCP   c. SNMP
    b. NAT   d. Multicast

40. Which of the following protocols can be used for inter-AS routing?
    a. RIP   **c. BGP**
    b. OSPF   d. IGRP

41. The data unit used in network layer is named as:
    a. Segment   c. Message
    b. Datagram   d. Frame

42. Given a network as described in the following figure:
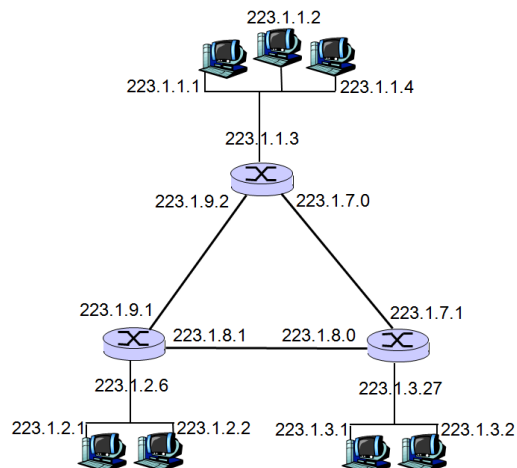
    a. 3   c. 5
    b. 4   d. 6

Part V: Principles of Data Link layer

43. IEEE 802.11 standard uses collision avoidance approach (CSMA/CA) instead of collision detection (CSMA/CD) because:
    a. A station may not be aware of the existence of other stations
    b. It is not possible for collisions to happen in wireless networks
    c. It is difficult to detect collisions in wireless networks
    d. Collisions can be detected, however, it is not possible to recover from collisions

44. In CSMA/CD, after the fifth collision, what is the probability that a node chooses K = 2?
    a. 1/4   c. 1/25
    b. 1/5   **d. 1/32**

45. How big is the MAC address space?
    a. 2^8
    b. 2^16
    c. 2^32
    d. 2^48

46. Consider the network as in the diagram below with nodes A, C, and D. Suppose that the MAC tables of all switches B1-B4 are empty initially. The switches use learning algorithm to remember addresses of the nodes. What is the expected result after the following actions are completed?
    - C sends to A
    - A sends to C
    - D sends to C
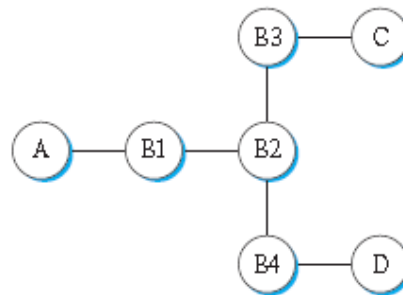
    a. All switches know MAC addresses of all the nodes
    b. B1 does not know MAC address of node D
    c. B4 does not know MAC address of node C
    d. B3 does not know MAC address of node D

47. Which is an advantage of Random Access protocols in comparison with Channel Partitioning methods, such as TDMA or FDMA, when applied to multiple access links:
    a. There is no collision
    b. The shared channel can be used more efficiently
    c. The quality of services can be guaranteed
    d. Data transmission rate can be guaranteed

48. Which is an advantage of CSMA/CD in comparison with pure CSMA?
    a. It is easier to implement
    b. The utilization of the channel can be improved
    c. Collisions can never happen
    d. Reduce the possibility for collisions to happen

49. When moving a computer from LAN A to LAN B, where LAN A and LAN B belong to different subnets:
    a. The MAC address of the computer will be changed
    b. The IP address of the computer will be changed
    c. Both MAC and IP addresses of the computer will be changed
    d. Both MAC and IP addresses of the computer will not be changed

50. At Data Link Layer, data is transmitted in:
    a. Segment
    b. Datagram
    c. Packet
    d. Frame

51. IEEE 802.11 standard uses collision avoidance approach (CSMA/CA) instead of collision detection (CSMA/CD) because:
    a. A station may not be aware of the existence of other stations
    b. It is not possible for collisions to happen in wireless networks
    c. It is very hard to detect collisions in wireless networks
    d. Collisions can be detected, however, it is not possible to recover from collisions

52. Which of the following factors that helps to increase the performance of Slotted Aloha in comparison with Pure Aloha?
    a. Clocks of all the nodes in the network are synchronized
    b. Time is divided equally into discrete slots, and the length of each time slot is equal to the time of sending a data frame
    c. Data can only be sent at the beginning of time slots
    d. All (a), (b), and (c) are correct

53. For an Ethernet LAN using Exponential backoff algorithm and having link speed of 100Mbps: supposed that host A wants to send data to host B and has tried 8 times without any success due to collisions. What is the maximum time that host A may have to wait in order to start the 9th attempt?
    a. ~50 ms
    b. ~1.3 ms
    c. ~1306 ms
    d. ~5.2 ms

54. A computer A in a local LAN, which is connected to the Internet through Gateway G. A sends a request to a Web server W in the Internet. What is the value of the destination address of the MAC frame carrying the request that A sends out?
    a. MAC address of the Gateway G
    b. MAC address of the Web server W
    c. IP address of the Gateway G
    d. IP address of the Web server W

Part VI: Network security

55. Public key cryptography is often used to encrypt secret key of a symmetric algorithm. The actual message is then encrypted with the secret key. The reason for this approach is:
    a. It is safer
    b. It is more efficient in terms of computation
    c. It is the only way to safely protect the message
    d. All (a), (b) and (c) are correct

56. Secure Socket Layer (SSL) uses?
    a. Only Public-key cryptography
    b. Only Symmetric-key cryptography
    c. Both Public-key and Symmetric-key cryptography
    d. Neither Public-key nor Symmetric-key cryptography

57. In Digital Signature, which type of key is used to verify the signature?
   a. Symmetric key
   b. Private key
   c. Public key
   d. No key

58. In cryptography, block cipher is considered safer than substitution cipher because:
   a. It is easier to break substitution cipher using analytic attack.
   b. Block cipher is easier to implement.
   c. Both (a) and (b) are correct.
   d. Both (a) and (b) are wrong.

59. Hash function is used to create digests from large messages. The digest usually has:
   a. bigger size than the original message
   b. smaller size than the original message
   c. fixed size
   d. variable size

60. A digital certificate consists of:
   a. Private key of the certificate owning entity
   b. Public key of the certificate owning entity
   c. Private key of the issuer
   d. Public key of the issuer

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Faculty/Department   **Lecturer**