University of Pretoria

SEMESTER TEST: 17 MARCH 2022

COURSE: Computer Science
PAPER: COS332

TIME: 1 hour
MARKS: 40

EXAMINER: Prof MS Olivier

THIS PAPER CONSISTS OF 10 PAGES.

ANSWER ALL QUESTIONS.
NO CALCULATORS PERMITTED
YOU MAY USE THE BACK OF THIS TEST PAPER FOR CALCULATIONS

Question 1

In each case select the alternative that fits the question best and write only the corresponding letter on your answer sheet.

a) A BBS (bulletin board system) was mostly used in the past for

A: Playing interactive games
B: Uploading and downloading of software
C: Browsing the web
D: Communication, bypassing the network of the national telephone operator
E: Online shopping

b) A layer in the protocol stack generally provides services for

A: The layer above it
B: The layer below it
C: Its peer layer
D: The application layer
E: The physical layer

c) The nom.za second-level domain is intended to allow ... to register subdomains within it.

A: Nomads
B: Individuals
C: Parties who handle nominations for potential office bearers
D: Those who provide authoritative definitions of nomenclature
E: None, because no such second-level domain exists

d) A NIC (network information centre)

A: Provides information about the current status of an ISP's network.
B: Allocates IP addresses to ISPs and some other organisations.
C: May serve as a TLD registry.
D: More than one of the above
E: All of the above

e) It is possible to obtain an authoritative list of TLD registries from

A: Wikipedia
B: IANA's website
C: https://www.rfc-editor.org/
D: The website of the IETF
E: Any root name server

f) Which of the following standards describe(s) directory access protocols?

A: LDAP
B: X.500
C: CMOT
D: More than one of the above
E: All of the above

10/20

g) Wikipedia says about one of the ISO OSI layers that it is, for example, useful in "web conferencing, in which the streams of audio and video must be synchronous to avoid so-called lip sync problems. Flow control ensures that the person displayed on screen is the current speaker." Which layer is it referring to?

A: 7
B: 6
C: 5
D: 4
E: 3

h) The primary metric used by interior gateway protocols is

A: Cost
B: Hop count
C: Distance
D: Static routing tables
E: Speed
F: Noise

i) The class of protocols used for routing between autonomous systems is known as

A: IGPs
B: BGPs
C: EGPs
D: RIP
E: Peering

j) DHCP is an example of a ... protocol

A: Network management
B: Bootstrapping
C: Routing
D: Directory access
E: Database handling and copying

k) In the client-server model interaction between the client and server is best characterised as the exchange of

A: Packets
B: Messages
C: Requests and responses
D: Commands and replies
E: Headers

l) On which of the ISO OSI layers do(es) error checking primarily occur?

A: 7
B: 4
C: 2
D: More than one of the above
E: All of the above

m) When using X11 to display output (without tunnelling) one has to provide

A: The address of the computer on which information should be displayed
B: The number of the physical display to be used for output
C: The resolution of the screen used to display the information
D: More than one of the above
E: All of the above

n) In order to organise and rearrange various X11 windows on a display, one needs

A: A Linux computer
B: A window manager at the X11 server
C: A window manager at the X11 client
D: Multiple screens
E: An X11 window environment on the 'terminal'

o) For X11 output one can generally control the size of the displayed window through the ... parameter.

A: Size
B: Geometry
C: Magnification
D: Resolution
E: Aspect ratio

p) Which of the following data streams generally work(s) better with an unreliable layer 4 protocol?

A: Web page
B: File transfer
C: Audio
D: More than one of the above
E: All of the above

q) If MIME is deemed to be a data communications protocol it would fit best on layer ... of the ISO OSI model.

A: 7
B: 6
C: 5
D: 4
E: 3

r) When writing an application that will serve as a server in a client-server architecture, the application would (in its role as server) open a socket that would

A: Be specified as an address and port number
B: Initiate connections
C: Wait for connections
D: More than one of the above
E: All of the above

s) Fieldata is

A: A mechanism to describe the layout of fields on a screen
B: An old character encoding scheme
C: An application layer protocol
D: More than one of the above
E: All of the above

t) If a browser requests one of a certain set of character encodings and the server cannot encode its output using any of those encodings, it would return an error ...

A: 402
B: 403
C: 404
D: 405
E: 406

[20]

Question 2

Assume computer addresses consist of a simple number. The six computers with addresses 1 to 6 are name servers (and other name servers may exist on the network). Node 1 is a root name server.

The following zone files exist on hosts 1 to 6. The zone files are for particular nodes in the DNS hierarchy, although this is not indicated for any of the zone files listed below. Your task is to provide the address (in other words a number) that the DNS queries following the zone files will return. In cases where the name cannot be resolved (either because it does not exist, or insufficient information to resolve it has been provided), write "Error" (rather than a number) in the space provided on the answer sheet.

Node address:		1
c	NS	4
n	NS	16

Node address:		2
g	A	10
k	A	12
l	A	15

Node address:		3
f	A	20
f	NS	13
m	A	3

Node address:		4
d	NS	5
e	NS	6
g	A	15
k	A	16

Node address:		5
a	A	3
a	NS	2
b	A	6
b	NS	3
c	NS	4

Node address:		6
h	A	11
i	A	14
j	NS	14
l	A	5
m	A	1

Provide the resolved address for each of the following queries, or write "Error" if the query cannot be resolved.

a) b.d.c (query type A) 6 (1)

b) g.a.d.c (query type A) 10 (1)

c) a.d.c (query type A) 3 (1)

d) m.e.c (query type NS) Error (1)

e) n. (query type NS) 16 (1)

[5]

8./...

Question 3

Suppose a network uses the Bellman-Ford algorithm to perform routing. At some time t_0 the routing tables at routers C, D and E contain the information provided below. Each routing table consists of three columns: destination, cost, and the next hop to achieve delivery at the indicated cost.

Node C		
A	2	B
D	3	D

Node D		
A	20	E
C	3	C
E	4	E
G	8	E

Node E		
A	15	F
D	4	D
F	5	F
G	5	F

The only exhanges of routing tables that occur during the time period of interest are the following: At time $t_1 > t_0$ node C sends its routing table to node D. At time $t_2 > t_1$ node E sends its routing table to node D.

a) What will the entry for destination A be in node D's routing table, after receiving (and processing) the routing table from node C (but prior to t_2)? (1)

b) What will the entry for destination B be in node D's routing table, after receiving (and processing) the routing table from node C (but prior to t_2)? (1)

c) What will the entry for destination F be in node D's routing table, after receiving (and processing) the routing table from node E? (1)

d) What will the entry for destination G be in node D's routing table, after receiving (and processing) the routing table from node E? (2)

[5]

9./...

Question 4

Dijkstra's algorithm works by adding one node at a time to a set of nodes that are reachable from some given node. Assume this set is called S. If we want to determine routes from node A then the set S will be

$$S = \{A\}$$

during round 1. In general, the round number, i is therefore

$$i = |S|$$

for the contents of S at the start of that round.

Assume your network consists of five routers, A, B, C, D, E. The costs of the routers that are linked directly are as follows:

A↔B:	1
A↔C:	10
B↔D:	2
C↔D:	5
C↔E:	1
D↔E:	3

5/5

a) Which node is added to S when progressing from round 3 to round 4? E (1)

b) What will the initial cost be to send a message between A and C (during round 1)? (1) 10

c) Which node will perform the final delivery to node C at the end of round 3? (1) D

d) What will the calculated cost be to send a message between A and C at the end of round 4? (1) 7

e) During which round does node E become reachable from node A? (1) 3

		ABCDE	
A	BC	0 1 10 0 0	0 A [5] A 0 0
A, B	C D	0 1 10 2 0	10./... 0 A A B 0
AB D	C, E	0 1 5 2 3	0 A D B D
ABD E			

			ABCDE	ABCDE
1	A	BC	0 1 10 00	0 AA 00
2	AB	C D	0 1 10 3	0 A A B 0
3	AB D	C E	0 1 10 3 6	CA B B D
4	AB DE	C	0 1 7 3 6	0 A E B D

Question 5

a) Which regional Internet registry (RIR) is reponsible for handling matters related to Europe? Just provide their acronym. EINX (1)

b) The Internet has its origins in a network project that started in 1969. What was the name of this predecessor (or ancestor) of the Internet? ARPA Net x (1)

c) On which ISO OSI layer does Bluetooth exist, in principle? (For purposes of this question, ignore technical details of Bluetooth that most non-technical users are unaware of, such as which parts of the frequency spectrum it uses.) Provide the number of the layer. L1 (1) x

d) MIDI (Musical Instrument Digital Interface) is a technical standard that describes means to connect electronic musical instruments, computers, and related audio devices for playing, editing, and recording music. It is possible to use MIDI to stream music across a network, utilising less bandwidth than, say, MP3 would have needed. In simple terms, the 'notes' are sent via the nework, rather than the sounds of notes. On which ISO OSI layer would MIDI fit? Provide the name of the layer. 8 L6 x (1)

e) Which person worked as the RFC-editor in the early years of the Internet (before the RFC-editor became a system)? Tim-Berners Lee (1) 3/5

[5]

TOTAL **[40]**

END OF PAPER