MIDTERM EXAM

ECPE 170 – Computer Systems and Networks – Spring 2017

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Lab Topic: MIDTERM

a) :~$ wget http://www1.pacific.edu/~jshafer3/ecpe170/exam1.tar.bz2

b) I had to extract the files in the home folder before performing the following copy command:
:~$ cp -R ~/exam1 ~/bitbucket/2017_spring_ecpe170

c) MAKEFILE CODE

```
# The variable CC specifies which compiler will be used.
# (because different unix systems may use different compilers)
CC=gcc

# The variable CFLAGS specifies compiler options
#   -c :    Only compile (don't link)
#   -Wall:  Enable all warnings about lazy / dangerous C programming
#   -std=c99: Using newer C99 version of C programming language
CFLAGS=-c -Wall -std=c99 -Wextra -O1 -O2 -O3 -g

# All of the .h header files to use as dependencies
HEADERS=main.h

# All of the object files to produce as intermediary work
OBJECTS=main.o

# The final program to build
EXECUTABLE=exam1

# --------------------------------------------

all: $(EXECUTABLE)

$(EXECUTABLE): $(OBJECTS)
	$(CC) $(OBJECTS) -o $(EXECUTABLE)

%.o: %.c $(HEADERS)
	$(CC) $(CFLAGS) -o $@ $<

clean:
	rm -rf *.o $(EXECUTABLE)
```

d) :~$ cd ~/bitbucket/2017_spring_ecpe170/exam1 "I moved to my exam1 folder"
:~$ make "I executed the Makefile"
:~$ ./exam1 "I executed the program"

OUTPUT:

```
Document read from file:
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Chapter 1: A Long-Expected Party

When Mr. Bilbo Baggins of Bag End announced that he would shortly be
celebrating his eleventy-first birthday with a party of special
magnificence, there was much talk and excitement in Hobbiton.

Bilbo was very rich and very peculiar, and had been the wonder of the
Shire for sixty years, ever since his remarkable disappearance and
unexpected return. The riches he had brought back from his travels had
now become a local legend, and it was popularly believed, whatever the
old folk might say, that the Hill at Bag End was full of tunnels
stuffed with treasure. And if that was not enough for fame, there was
also his prolonged vigour to marvel at. Time wore on, but it seemed to
have little effect on Mr. Baggins. At ninety he was much the same as
at fifty. At ninety-nine they began to call him well-preserved ; but
unchanged would have been nearer the mark. There were some that shook
their heads and thought this was too much of a good thing; it seemed
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unfair that anyone should possess (apparently) perpetual youth as well as (reputedly) inexhaustible wealth.

'It will have to be paid for,' they said. 'It isn't natural, and trouble will come of it!'

But so far trouble had not come; and as Mr. Baggins was generous with his money, most people were willing to forgive him his oddities and his good fortune. He remained on visiting terms with his relatives (except, of course, the Sackville-Bagginses), and he had many devoted admirers among the hobbits of poor and unimportant families. But he had no close friends, until some of his younger cousins began to grow up.

e) :~$ time./exam1 “Executed program run time”

real 0m0.002s “The time the program took”

f) :~$ make clean
:~$ make
:~$ valgrind --tool=memcheck --leak-check=yes --show-reachable=yes --num-callers=20 --log-file=memcheck.txt ./exam1
:~$ gedit memcheck.txt &

MEMCHECK OUTPUT

```
==3494== Memcheck, a memory error detector
==3494== Copyright (C) 2002-2015, and GNU GPL'd, by Julian Seward et al.
==3494== Using Valgrind-3.11.0 and LibVEX; rerun with -h for copyright info
==3494== Command: ./exam1
==3494== Parent PID: 2039
==3494==
==3494==
==3494== HEAP SUMMARY:
==3494==     in use at exit: 3,600 bytes in 30 blocks
==3494==   total heap usage: 64 allocs, 34 frees, 9,872 bytes allocated
==3494==
==3494== 120 bytes in 1 blocks are definitely lost in loss record 1 of 2
==3494==    at 0x4C2DB8F: malloc (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3494==    by 0x4EA89E7: getdelim (iogetdelim.c:62)
==3494==    by 0x40069C: getline (stdio.h:117)
==3494==    by 0x40069C: main (main.c:58)
==3494==
==3494== 3,480 bytes in 29 blocks are definitely lost in loss record 2 of 2
==3494==    at 0x4C2DB8F: malloc (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3494==    by 0x4EA89E7: getdelim (iogetdelim.c:62)
==3494==    by 0x4006E4: getline (stdio.h:117)
==3494==    by 0x4006E4: main (main.c:72)
==3494==
==3494== LEAK SUMMARY:
==3494==    definitely lost: 3,600 bytes in 30 blocks
==3494==    indirectly lost: 0 bytes in 0 blocks
==3494==      possibly lost: 0 bytes in 0 blocks
==3494==    still reachable: 0 bytes in 0 blocks
==3494==         suppressed: 0 bytes in 0 blocks
==3494==
==3494== For counts of detected and suppressed errors, rerun with: -v
==3494== ERROR SUMMARY: 2 errors from 2 contexts (suppressed: 0 from 0)
```

g)

```
 ==3768== Memcheck, a memory error detector
==3768== Copyright (C) 2002-2015, and GNU GPL'd, by Julian Seward et al.
==3768== Using Valgrind-3.11.0 and LibVEX; rerun with -h for copyright info
==3768== Command: ./exam1
==3768== Parent PID: 3703
==3768==
==3768== Invalid free() / delete / delete[] / realloc()
==3768==    at 0x4C2EDEB: free (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x40073D: main (main.c:75)
==3768==  Address 0x52062d0 is 0 bytes inside a block of size 120 free'd
==3768==    at 0x4C2EDEB: free (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4006F8: main (main.c:73)
==3768==  Block was alloc'd at
==3768==    at 0x4C2DB8F: malloc (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4EA89E7: getdelim (iogetdelim.c:62)
==3768==    by 0x4006EC: getline (stdio.h:117)
==3768==    by 0x4006EC: main (main.c:72)
==3768==
==3768== Invalid read of size 1
==3768==    at 0x4E88CC0: vfprintf (vfprintf.c:1632)
==3768==    by 0x4F4FDFE: __printf_chk (printf_chk.c:35)
==3768==    by 0x400784: printf (stdio2.h:104)
==3768==    by 0x400784: document_print (main.c:144)
==3768==    by 0x400784: main (main.c:84)
==3768==  Address 0x52032b0 is 0 bytes inside a block of size 120 free'd
==3768==    at 0x4C2EDEB: free (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4006A8: main (main.c:59)
==3768==  Block was alloc'd at
==3768==    at 0x4C2DB8F: malloc (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4EA89E7: getdelim (iogetdelim.c:62)
==3768==    by 0x40069C: getline (stdio.h:117)
==3768==    by 0x40069C: main (main.c:58)
==3768==
==3768== Invalid read of size 1
==3768==    at 0x4EB32ED: _IO_file_xsputn@@GLIBC_2.2.5 (fileops.c:1301)
==3768==    by 0x4E8850A: vfprintf (vfprintf.c:1632)
==3768==    by 0x4F4FDFE: __printf_chk (printf_chk.c:35)
==3768==    by 0x400784: printf (stdio2.h:104)
==3768==    by 0x400784: document_print (main.c:144)
==3768==    by 0x400784: main (main.c:84)
==3768==  Address 0x52032d0 is 32 bytes inside a block of size 120 free'd
==3768==    at 0x4C2EDEB: free (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4006A8: main (main.c:59)
==3768==  Block was alloc'd at
==3768==    at 0x4C2DB8F: malloc (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4EA89E7: getdelim (iogetdelim.c:62)
==3768==    by 0x40069C: getline (stdio.h:117)
==3768==    by 0x40069C: main (main.c:58)
==3768==
==3768== Invalid read of size 1
==3768==    at 0x4C35030: __GI_mempcpy (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4EB3241: _IO_file_xsputn@@GLIBC_2.2.5 (fileops.c:1319)
==3768==    by 0x4E8850A: vfprintf (vfprintf.c:1632)
==3768==    by 0x4F4FDFE: __printf_chk (printf_chk.c:35)
==3768==    by 0x400784: printf (stdio2.h:104)
==3768==    by 0x400784: document_print (main.c:144)
==3768==    by 0x400784: main (main.c:84)
==3768==  Address 0x52032d0 is 32 bytes inside a block of size 120 free'd
==3768==    at 0x4C2EDEB: free (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4006A8: main (main.c:59)
==3768==  Block was alloc'd at
==3768==    at 0x4C2DB8F: malloc (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4EA89E7: getdelim (iogetdelim.c:62)
==3768==    by 0x40069C: getline (stdio.h:117)
==3768==    by 0x40069C: main (main.c:58)
==3768==
==3768== Invalid read of size 1
==3768==    at 0x4C35040: __GI_mempcpy (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4EB3241: _IO_file_xsputn@@GLIBC_2.2.5 (fileops.c:1319)
==3768==    by 0x4E8850A: vfprintf (vfprintf.c:1632)
==3768==    by 0x4F4FDFE: __printf_chk (printf_chk.c:35)
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==3768==    by 0x400784: printf (stdio2.h:104)
==3768==    by 0x400784: document_print (main.c:144)
==3768==    by 0x400784: main (main.c:84)
==3768==  Address 0x52032ce is 30 bytes inside a block of size 120 free'd
==3768==    at 0x4C2EDEB: free (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4006A8: main (main.c:59)
==3768==  Block was alloc'd at
==3768==    at 0x4C2DB8F: malloc (in /usr/lib/valgrind/vgpreload_memcheck-amd64-linux.so)
==3768==    by 0x4EA89E7: getdelim (iogetdelim.c:62)
==3768==    by 0x40069C: getline (stdio.h:117)
==3768==    by 0x40069C: main (main.c:58)
==3768==
==3768==
==3768== HEAP SUMMARY:
==3768==     in use at exit: 0 bytes in 0 blocks
==3768==   total heap usage: 64 allocs, 65 frees, 9,872 bytes allocated
==3768==
==3768== All heap blocks were freed -- no leaks are possible
==3768==
==3768== For counts of detected and suppressed errors, rerun with: -v
==3768== ERROR SUMMARY: 3281 errors from 5 contexts (suppressed: 0 from 0)
```

h) while in my exam 1 directory I used the following commands to upload my files to Bitbucket: