FACULTY OF
Engineering, Computing
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Department of Computer Science & Software Engineering
The University of Western Australia

Mid-Semester Test
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Systems Programming 2002 (CITS2002)

This paper contains 1 section

This paper contains: 9 pages (including this title page)
Time allowed: 45 minutes (no additional reading time)

Each question is worth 1 mark.
Marks for this paper total 20.
Candidates should attempt ALL questions.
This is a closed book examination – no written materials, electronic devices or calculators are permitted.

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1.

(1) Which of the following statements is NOT true about the traditional role of the C preprocessor?

A. The preprocessor imports header files into C source code.

B. The preprocessor evaluates and replaces `#define` directives.

C. The preprocessor detects the current machine architecture and generates architecture-specific instructions when requested.

D. The preprocessor removes comments from C source code.

(2) Which of the following is NOT a valid C99 preprocessor directive?

A. #define

B. #if

C. #else

D. #while

(3) Consider the following C99 Boolean expression:

```
a && (a || b)
```

Which of the following is equivalent to this expression?

A. `true`

B. `a`

C. `a || !b`

D. `!a || b`

(4) Consider the following C code:

```
int a = 0;

void go(void)
{
  int b = 0;
  for (int c = 0 ; c < 10 ; ++c)
  {
    int d = 0;
    ...
  }
  << X >>
}
```

At the point marked `<< X >>` in the code, which variables are in scope?

A. Variable `b` only.

B. Variables `a` and `b` only.

C. Variables `b` and `c` only.

D. All of the variables except `d`.

(5) Consider the following C99 function:

```
void go(void)
{
  int x = 5;
  if (x < 10)
  {
    int x = 3;
    x = x + 1;
    printf("x = %i\n", x);
  }
}
```

What is printed, if anything, when we attempt to compile and execute `go`?

A. A compile-time error is generated because the variable `x` is multiply defined.

B. x = 4

C. x = 6

D. A run-time error is generated because the variable `x` is multiply defined.

(6) Consider the following function:

```
void go(void)
{
  int x = 7;
  int y = 2;

  printf("Ans = %d\n", x++ - ++y);
}
```

What is printed when the `go` function is executed?

A. `Ans = 3`

B. `Ans = 4`

C. `Ans = 5`

D. The result is undefined; the output will depend on the computer architecture.

(7) Consider the following function:

```
void go(void)
{
  for (int i = 0; i <= 10; i++)
  {
    if ((i % 2) == 1)
    {
      continue;
    }
    if ((i % 3) == 1)
    {
      continue;
    }
    printf("%i  ", i);
  }
  printf("\n");
}
```

What is printed when the `go` function is executed?

A. `0 1`

B. `0 5 10`

C. `0 2 6 8`

D. `6`

(8) Consider the following functions:

```
void f1(int x)
{
  do
  {
    printf("hello\n");
    x++;
  } while (x < 10);
}

void f2(int x)
{
  while (x < 10)
  {
    printf("hello\n");
    x++;
  }
}
```

Assuming that the same value is passed to both functions, under what circumstances do `f1` and `f2` produce the same output?

A. Only when the value passed is < 10.

B. Only when the value passed is ≤ 10.

C. Only when the value passed is $= 10$.

D. Never, regardless of the value passed.

(9) Consider a function of type `void`. Which of the following statements about the number of `return` statements contained within the function is true?

A. The function must have precisely 0 `return` statements.

B. The function may have 0 or more `return` statements.

C. The function must have precisely 1 `return` statement.

D. The function must have at least 1 `return` statement.

(10) Which one of the following statements about function parameters is true?

A. If there is only one parameter, the parameter list is not required.

B. A function's parameters are known as "actual parameters".

C. Functions may be declared to receive a variable number of paerameters.

D. A local variable may have the same name as a function's parameter, overriding the use of the parameter.

(11) Which of the following statements about character arrays in C is/are true?

i. Indexing starts from 1.
ii. Character arrays are always terminated by the NULL-byte.
iii. Array elements are all of the same data type.

A. i. only.

B. ii. only.

C. iii. only.

D. None of i., ii., or iii.

(12) Assume `line` is a global variable holding a valid string of characters. Consider the following function:

```
void go(void)
{
  line[0] = line[strlen(line)];
}
```

Which of the following statements is true after the execution of the function?

A. The string length of `line` will be unchanged.

B. The string length of `line` will always be reduced.

C. The string length of `line` will always become zero.

D. The result is undefined.

(13) Which of the following array initialization statements is valid?

i. `char array[] = "hello";`
ii. `char array[5] = "hello";`
iii. `char array[6] = "hello";`

A. iii only.

B. i. and ii. only.

C. i. and iii. only

D. All of i., ii., and iii.

(14) Consider the following function:

```
void go(void)
{
  char str[] = "hello world";
  str[5] = '\n';
  str[8] = '\0';
  printf("length = %i\n", strlen(str));
}
```

What is printed when the `go` function is executed?

A. `length = 5`

B. `length = 8`

C. `length = 11`

D. `length = 12`

(15) Consider a square 2D integer array named `array` of size `N`, initially filled with zeroes. Which of the following code fragments places a 1 down the two main diagonals, forming a big (and complete) "X" of 1s?

A.
```
for (int i = 0; i < N; i++)
{
  array[i][i] = 1;
  array[N-i][i] = 1;
}
```

B.
```
for (int i = 0; i < N; i++)
{
  array[i][i] = 1;
  array[N-i-1][i] = 1;
}
```

C.
```
for (int i = 0; i < N; i++)
{
  array[i][i] = 1;
  array[N-i][i-1] = 1;
}
```

D. None of the options, as you need a nested loop to access elements of a 2D array.

(16) Which of the following statements about how lines are terminated in text files is true?

A. The end of a line is represented by the NULL-byte character.

B. The end of a line is represented by the newline character.

C. The end of a line is represented by the carriage-return character followed by the end-of-line character.

D. The way the end of a line is represented is operating-system dependent.

(17) What happens if the `fopen` function fails to open a file for reading?

A. Execution continues normally.

B. The operating system simply ignores the request.

C. The process is blocked until the file can be opened for reading.

D. An error message is printed to the `stderr` stream.

(18) Consider the following code:

```
char buffer[100];
fgets(buffer, sizeof buffer, fp);
```

Which of the following statements about the call to the `fgets` function is always true?

A. `fgets` reads all the bytes in the file up to the next newline character.

B. `fgets` places a NULL-byte in the character array if reading was successful.

C. `fgets` only returns NULL if the end-of-the-file is reached.

D. `fgets` will stop reading from the file when it encounters the NULL-byte.

(19) Which one of the following best characterizes an operating system process:

A. a process is a set of instructions followed by an engineer for detecting faults in a computer.

B. a process is a program that is part of an operating system.

C. a process is the methodology for learning to write programs.

D. a process is a computer program in execution.

(20) Consider the following C code:

```
void function(void)
{
    fork();
    fork();
    printf("hello world\n");
}
```

If the above code executes successfully, which of the following statements will always be true?

A. The output "hello world" will be printed once.

B. The output "hello world" will appear exactly twice, on two separate lines.

C. The output "hello world" will appear exactly four times, on four separate lines.

D. The form of the output cannot be determined from the above code.
