1. What is the output of the following script?

```perl
#!/usr/local/bin/perl
$i = 0; $j = 1;
if ($i = 2) { print $i; }
else { print $j; }
if ($i = 0) { print $i; }
else { print $j; }
```

   (a) 11
   (b) 21
   (c) 10
   (d) 01
   (e) It produces an error message.

(2)

2. Consider the function pair "split" and "join". Only one of them makes use of regular expressions. Yet they are approximately inverse functions. Which of the following is correct?

   (a) The function "split" uses a regular expression because it involves string concatenation.
   (b) The function "join" uses a regular expression because a joined string must match a given pattern.
   (c) The function "split" does not use a regular expression because it matches a string to a pattern.
   (d) The function "join" does not use a regular expression because it involves string concatenation, instead of pattern matching.
   (e) The function "split" uses a regular expression because it truncates a pattern.

(2)

3. Which statement about the following script is true (assuming that the three files exist in the current directory)?

```perl
#!/usr/bin/env perl w
# Prints all lines from all three files
@files = ("f1.txt", "f2.txt", "f3.txt");
for ($i = 0; $i<$#files; $i++){
        open (FILE, $files[$i]) || die "Cannot open $files[$i]\n";
        @lines = <FILE>;
        close FILE;
        push @all_lines, @lines;
}

print @all_lines;
```

  (a) The script performs exactly what is described in the comment in line 2.

  (b) The script produces an error.

  (c) The script does not print the first line from the last file.

  (d) The script does not print the last line from each file.

  (e) The script prints the lines from the first file three times.

(2)

4. The following code is part of an HTML form:

```html
<SELECT NAME=year SIZE=1>
<OPTION CHECKED>Freshman</OPTION>
<OPTION>Sophomore</OPTION>
<OPTION>Junior</OPTION>
<OPTION>Senior</OPTION>
</SELECT>
```

In a CGI script that processes this form data, how can you test if "Junior" is selected?

  (a) if ($in{'Junior'} eq "CHECKED")

  (b) if ($in{'Junior'} eq "year")

  (c) if ($in{'year'} eq "2")

  (d) if ($in{'year'} eq "Junior")

  (e) if (param() eq "Junior")

(2)

5. An HTML form consists of two textfields (username and password) and no other form elements. A CGI script stores these in the variables $user and $pass. Which security risks are left open even after the following code has been applied?

```
if ($user =~ /[^\w \.\-]/ or $pass =~ /[^\w\-]/ or
    $ENV{'CONTENT_LENGTH'} > 100 or
    $user eq "" or $pass eq "") {
    print header();
    print "<HTML>Invalid input</HTML>";
    die;
}
```

   (a) The password could be empty.

   (b) Input from radio buttons could contain unexpected values.

   (c) It would be dangerous to print the password because it could contain Javascript code.

   (d) It would be dangerous to use the username in an email address because it could contain control characters.

   (e) It is possible that $user and $pass contain larger amounts of data than expected if the HTTP method is GET.

(2)

6. Which information about a client is NOT usually available to a server via the http protocol?

   (a) The IP address of a user.

   (b) The URL of the referring webpage.

   (c) For password protected pages: the username and password.

   (d) The URL of a user's homepage.

   (e) The MIME types of applications accepted by the user's browser.

(2)

7. The main difference between PHP and Perl is that

   (a) Perl runs slower than PHP.

   (b) Perl is a server-side technology but PHP is client-side.

   (c) PHP embeds the script into the HTML code whereas Perl scripts print HTML.

   (d) Only PHP can be used to display databases on the web.

   (e) PHP is a webserver extension whereas Perl uses CGI.

(2)

8. The principles of information architecture can be applied to designing server-side applications, such as shopping carts. Which of the following sentences is true?

   (a) Information architecture uses metaphors (eg. "add item", "check out") so that users understand the structure of a website.

   (b) Information architecture uses techniques from architecture and engineering and applies them to website design.

   (c) Information architecture describes the networking layer of server-side applications in a graphical manner.

   (d) Information architecture describes the architectural connections between the APIs and devices involved in a server-side application.

   (e) None of the above.

(2)

9. Which of the following statements about web crawlers is NOT true?

   (a) A web crawler navigates through the web by finding the links on one page, and the links of linked pages and so on.

   (b) CGI technology can be used to write web crawler software allowing a user to query the web crawler while it is navigating through the web.

   (c) A web crawler parses remote web pages in order to find linked pages.

   (d) A web crawler connects to pages via the tcp protocol.

   (e) Web crawlers are used to build the databases of search engines.

(2)

10. In a Unix environment, which of the following activities poses a potential security risk for a web server because it requires entering user input into a system command.

    (a) Sending a "SELECT * FROM CUSTOMERS" command to a server-side database.

    (b) Setting cookies on a user's computer.

    (c) Asking a user to enter credit card information into a form.

    (d) Sending email from a CGI script back to a user.

    (e) Incorporating Javascript into pages that are generated by CGI scripts.

(2)

11. Which of the following is NOT related to Search Engine technologies?

    (a) metawords

    (b) Natural Language Processing

    (c) spider

    (d) robot.txt

    (e) inverted index

(2)

12. Which of the following is NOT true for object-oriented Perl?

    (a) Classes are called "packages" and stored in "modules".
    (b) Packages are invoked via "use". Methods are subroutines.
    (c) "Blessed" variables can be used without a package name.
    (d) Object-orientation was added to Perl in Version 5 and is implemented using references.
    (e) The term "new" in Perl is reserved. It can only be used to refer to the method "new", which is automatically provided for each class.

    (2)

13. The DBI interface expects a series of methods for retrieving and printing results from a database. Which of the following shows the methods in the correct order?

    (a) connect, prepare, execute, fetchrow, finish, disconnect
    (b) connect, prepare, execute, fetchrow, disconnect, finish
    (c) prepare, connect, execute, fetchrow, finish, disconnect
    (d) prepare, connect, execute, fetchrow, disconnect, finish
    (e) None of the above

    (2)

14. Which of the following statements in a function will retrieve the SECOND value sent to the function?

    (a) $iWeight = @_;
    (b) $iWeight = $_{'2'};
    (c) $iWeight = $_[1];
    (d) $iWeight = $_[2];
    (e) $iWeight = @_[1];

    (2)

15. Which of the following may be tested to determine if an HTML form has used the GET or POST method?

    (a) $ENV{'REQUEST_METHOD'}
    (b) $ENV[0]
    (c) $ENV{'QUERY_STRING'}
    (d) $REQUEST_METHOD{'ENV'}
    (e) None of the above

    (2)

    Total marks: [30]

Part 2: Please answer in a script book

1. Server-side web applications are programs or scripts that provide dynamic HTML content.

   (a) Name five different server-side web applications. Do not include search engines and event calendars in your list.

   (5)

   (b) For each application provide a brief explanation of the application.

   (5)

   (c) Name an example of an application domain for each application. Application domains are, for example, e-commerce or private homepages.

   (5)

   Total marks: [15]

2. An organisation wants to create an on-line event calendar. Any member of the organisation can access the calendar and retrieve all events that are scheduled for a specific month. Certain members of the organisation are allowed to enter new events into the calendar. Events may not overlap each other.

   (a) Describe the different components required for this server-side web application. You can include diagrams in your explanation.

   (5)

   (b) Describe the elements of each HTML form that you would design for this application in general terms. Do not include HTML code in your description. You can draw a diagram that shows what each form will look like.

   (4)

   (c) Describe how this application will work. Mentioned any special features that are required, for example, how is the calendar generated? What are the types of users of this application?

   (5)

   (d) Discuss any security issues that arise for this application.

   (3)

   (e) Discuss issues related to the maintenance of the application. What kinds of updates need to be performed at what times?

   (3)

   (f) Estimate the time it will take an experienced server-side web programmer to build such an application. Explain your answer.

   (2)

   Total marks: [22]

End of Paper

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