

BSCCS2003: Graded Questions with Solutions
Week 1

1. Consider the statement given below:

`curl http://127.0.0.1:8080`

Select the appropriate option that correctly identifies different components of the given statement. [MCQ : 2 points]

- ☐ Protocol: http, port: 127.0.0.1,
host-name: 8080, command: curl
- ☐ Protocol: http, host-name: 127.0.0.1,
port: 8080, command: curl
- ☐ Protocol: curl, host-ip: 8080,
host-name: 127.0.0.1, port: http
- ☒ Protocol: http, port: 8080,
host-ip: 127.0.0.1, command: curl

Solution: Here, “curl” is a command used to send a request.
“http” is the protocol.
“127.0.0.1” is the host-ip address.
“8080” is the port number.

2. Suppose a client machine C is communicating with a data center D located 12,500 km away from C. Assume that the TCP connection has been established and is kept alive. Calculate the RTT (Round trip time) in ms for an HTTP request. (Assume speed of light in cable is 2×10^8 m/s). [NAT : 3 points]

✓ 125

Solution: Recall that,

$$Speed = \frac{Distance \text{ (in m)}}{Time \text{ (in s)}}$$

$$\implies Time = \frac{Distance \text{ (in m)}}{Speed \text{ (in m/s)}}$$

So,

$$time = \frac{1.25 \times 10^7 \text{ m}}{2 \times 10^8 \text{ m/s}}$$

$$\implies \text{time} = 62.5 \text{ ms}$$

The round trip time = $62.5 \times 2 = 125 \text{ ms}$.

Therefore, the answer is **125 ms**.

3. Consider the given URL below:

`http://myserver.com/index.html?uid=10&sid=4032013`

Select the appropriate option that correctly identifies different components of the given URL. [MCQ : 2 points]

- ☒ Protocol: `http`, query-string: `uid=10&sid=4032013`, host-name: `myserver.com`, file-path: `index.html`
- ☐ Protocol: `myserver.com`, query-string: `index.html?uid=10&sid=4032013`, host-name: `http`, file-path: `myserver.com/index.html`
- ☐ Protocol: `http`, query-string: `index.html?uid=10&sid=4032013`, host-name: `http://myserver.com`, file-path: `index.html`
- ☐ Protocol: `myserver.com`, query-string: `index.html?uid=10&sid=4032013`, host-name: `http://myserver.com`, file-path: `myserver.com/index.html`

Solution: Here, HTTP is the protocol.

The query string is: “uid=10&sid=4032013”.

The host-name is: “myserver.com”.

The file path is: “index.html”.

4. Which of the following is/are true for a web browser? [MSQ : 1 point]

- ☒ A web browser is an application program to display web documents.
- ☒ A web browser sends an HTTP request and receives an HTTP response.
- ☐ A web browser is installed in a web server machine and hosts websites.
- ☐ A web browser is a web app.

Solution:

Option 1 : A web browser acts as a web client to send a request to the web server to fetch web pages.

Option 2 : Both the server and the client communicate with each other using HTTP protocol.

Option 3 : A web browser is an application installed in the client's system that is used to send HTTP requests.

Option 4 : A web browser is an application software used to access web applications.

5. Identify the correct order of the tasks that takes place when we request for `http://myserver.com/index.html`. [MCQ : 3 points]

1. The web browser sends an HTTP request to the server, requesting a copy of `index.html`.
 2. The web browser assembles the response and displays it.
 3. The server responds either with the requested resource or an error code.
 4. The web browser connects to the DNS server to get the server IP address for `myserver.com`
- ☐ 1-4-3-2
- ☐ 1-3-4-2
- ✓ ☒ 4-1-3-2
- ☐ 4-3-1-2

Solution:

As the first step, the web browser connects to a DNS server to get the IP address which is hosting “myserver.com”.

Then, the web browser sends an HTTP request, requesting a base html file (`index.html`) to the server.

Then, the server processes the request and returns the requested resource if found, else sends an error code.

Then, the web browser displays the response sent by the server.

6. The view in MVC architecture is responsible for _____. [MSQ : 1 point]

- ✓ ☒ Displaying the data.
- ☐ Storing and retrieving the data.
- ☐ Executing the the business logic.
- ✓ ☒ Receiving the data from the user.

Solution: View in the “MVC” is part of application to which user interacts directly. So, it can be used to display data and user can submit data using form which is an example of a view.

7. Let A be a website that receives 10,000 requests in a second. If each request has to be sent a response of size 150kB, what should be the minimum bandwidth (approximately) of the server serving A? [MCQ : 3 points]

- ☐ 4 Gbps
☐ 6 Gbps
☒ 12 Gbps
☐ 20 Gbps

Solution: Number of requests per second = 10,000

Amount of data to be sent back for each request = 150 kB

So, total amount of data to be sent back per second is $15 \times 10^5 \text{ kB} \approx 12 \text{ Gb}$.

Note: In practice, there will be some overhead that could result in even more bandwidth requirement.

8. Which of the following statements is/are true? [MSQ : 2 points]

- ☒ Internet Protocol (IP) is a set of rules that specifies one way to deliver data over the network.
☒ Domain Names are used in place of IP addresses.
☒ Hypertext is the text which contains links to other documents or websites.
☐ TCP stands for Traffic Control Protocol.

Solution:

- Internet Protocol (IP) is a set of rules that specifies one way to deliver data over the network.
- Domain Names are used instead of IP addresses.
- Hypertext is the text which contains links to other documents or websites.
- TCP is the Transmission Control Protocol.

Please refer to lecture 1.5 for more details

9. Consider the webpage link shown below:

<https://onlinedegree.iitm.ac.in/academics.html>

[MSQ : 1 point]

Which among the following is/are true?

- ☒ HTTPS is a protocol.
☐ onlinedegree.iitm.ac.in/academics.html is a domain name.

- ✓ <https://onlinedegree.iitm.ac.in/academics.html> is a url.
- ☐ <https://onlinedegree> is a root domain.

Solution: <https://onlinedegree.iitm.ac.in/academics.html>

- **HTTPS** is a protocol.
- **onlinedegree.iitm.ac.in** is a domain name.
- <https://onlinedegree.iitm.ac.in/academics.html> is a url.
- **iitm.ac.in** is a root domain.
- **onlinedegree** is a subdomain.

10. Which of the following is/are valid IPv4 address(es)? [MSQ : 2 points]

- ✓ [192.168.64.34](#)
- ☐ 192.168.256.1
- ✓ [34.39.43.202](#)
- ☐ 34.239.314.206

Solution: An IPv4 address has the format x.x.x.x, where x is called an octet and must be a decimal value between 0 and 255. Octets are separated by periods. An IPv4 address must contain three periods and four octets.
192.168.64.34 and 34.39.43.202 are valid IPv4 addresses.
192.168.256.1 and 34.239.314.206 are invalid IPv4 addresses.

<p style="text-align: center;">BSCCS2003: Graded Questions with Solutions</p> <p style="text-align: center;">Week 2</p>

1. Consider the following code: [MCQ : 2 points]

`<p id = "abc" class = "First Second" > This is a paragraph </p>`

Which of the following statements is true with respect to the above code?

- ☐ The Paragraph has one class "First Second".
- ✓ ☒ The Paragraph has two different classes, "First" and "Second".
- ☐ A Paragraph cannot have id and class together.
- ☐ A Paragraph cannot have any space within the class attribute.

Solution: Each HTML tag has "class" attribute and every tag or element can have multiple classes at the same time. Multiple class values can be added to a class attribute by separating them with a space character.

2. How will a browser handle the following code? [MSQ : 1 point]

```
<audio controls autoplay>
  <source src = "iitm.mp3" type = "audio/mp3">
  "sorry audio cannot be played"
</audio>
```

- ✓ ☒ If the browser supports audio tag and mp3 format, then it will start playing the audio as soon as the page is loaded.
- ☐ It will display the message 'sorry audio cannot be played', if the browser does not support mp3 format but supports the audio tag.
- ✓ ☒ It will display the message 'sorry audio cannot be played', if the browser does not support audio tag.
- ☐ None of the above

Solution: Autoplay is a boolean attribute. It can be used with audio and video. If present, audio/video will start playing as soon as the page loads.

3. Suppose you have a document which contains only lower case alphabets. How many bits are required to encode a character such that the size of the document is minimum?

Note:

- i) You can create your own encoding method.
- ii) Document contains all lower case alphabets.
- iii) Code for each alphabet should be of the same length.

[MCQ : 3 points]

- ☐ 3
- ☐ 4
- ☒ 5
- ☐ 6

Solution: There are 26 different characters in the document. Using n bits, we can encode 2^n different characters and $2^4 < 26 < 2^5$. So, we need at least 5 bits to represent 26 different characters.

4. Consider the following code:

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>Document</title>
    <style>
      body {
        color: red;
        color: green;
        color: yellow;
      }
    </style>
  </head>
  <body>
    IIT Madras
  </body>
</html>
```

What will be the color of text “IIT Madras”?

[MCQ : 1 point]

- ☐ Red
- ☐ Green
- ☒ Yellow
- ☐ Black

Solution: If a value is assigned more than once, the browser will choose the last assigned value of that property. So, in this case, it will choose ‘yellow’ as value of the property color.

5. How will a browser render the following code?

```
<div>
  Welcome to<span style="visibility: hidden">Modern</span>Application
  Development<span style="display: none">Course</span> Test.
</div>
```

[MCQ : 2 points]

- ☒ Welcome to Application Development Test.
- ☐ Welcome to Application Development Test.
- ☐ Welcome to Modern Application Development Course Test.
- ☐ Welcome to Application Development Test.

Solution: When “display: None” is applied to some element, it removes the element from the DOM. So, the browser will not display any white space in place of the element. But “visibility: hidden” does not remove the element from DOM but will make it invisible, so there will be white space in place of the target element.

6. Which of the following code segments will display the result given below? [MSQ : 3 points]

Welcome to IITM ONLINE DEGREE

IIT Madras, India’s top technical institute,
welcomes you to the **world’s first BSc Degree program**
in Programming and Data Science.

[Click here](#) for more details

- ☐ `<!DOCTYPE html>`
`<html>`
`<body>`

`<h1> Welcome to IITM ONLINE DEGREE </h1>`

`<p>IIT Madras, India’s top technical institute,
`
`welcomes you to the world’s first BSc Degree program`
`
 in Programming and Data Science. </p>`


```
<a url="https://onlinedegree.iitm.ac.in/">Click here for  
more details</a>  
</body>  
</html>
```

```
✓ <!DOCTYPE html>  
<html>  
<body>  
  
<h1> Welcome to IITM ONLINE DEGREE </h1>  
  
<p><b>IIT Madras</b>, India's top technical institute, <br>  
welcomes you to the <b> world's first BSc Degree program  
  </b> <br> in Programming and Data Science. </p>  
<a href="https://onlinedegree.iitm.ac.in/">Click here</a>  
for more details  
</body>  
</html>
```

```
○ <!DOCTYPE html>  
<html>  
<body>  
  
<h1> Welcome to IITM ONLINE DEGREE </h1>  
  
<p><b>IIT Madras</b>, India's top technical institute, <br>  
welcomes you to the <strong> world's first BSc Degree program  
  </strong> <br> in Programming and Data Science. </p>  
<a src="https://onlinedegree.iitm.ac.in/">Click here</a>  
for more details  
</body>  
</html>
```

```
✓ <!DOCTYPE html>  
<html>  
<body>  
  
<h1> Welcome to IITM ONLINE DEGREE </h1>  
  
<p><b>IIT Madras</b>, India's top technical institute, <br>  
welcomes you to the <strong> world's first BSc Degree program  
  </strong> <br> in Programming and Data Science. </p>  
<a href="https://onlinedegree.iitm.ac.in/">Click here</a>
```

```
for more details
</body>
</html>
```

Solution: The correct syntax for hyperlink is

```
<a href="https://onlinedegree.iitm.ac.in/">Click here</a>
```

So, options 1 and 3 are incorrect.

The text written under `` tag and `` tag will be displayed as bold.
So, options 2 and 4 will display the same result.

7. Calculate the 8-bit binary representation of decimal number 89.

Note : No white spaces are allowed in the answer.


[NAT : 2 points]

✓ 01011001

Solution: Decimal value = 89

Conversion from decimal to binary:

2	89	1
2	44	0
2	22	0
2	11	1
2	5	1
2	2	0
	1	



As per the above image, the binary representation will be 1011001. But since it has only 7 bits, we will add one zero in the beginning of the sequence (from the left) to make it an 8-bit sequence.

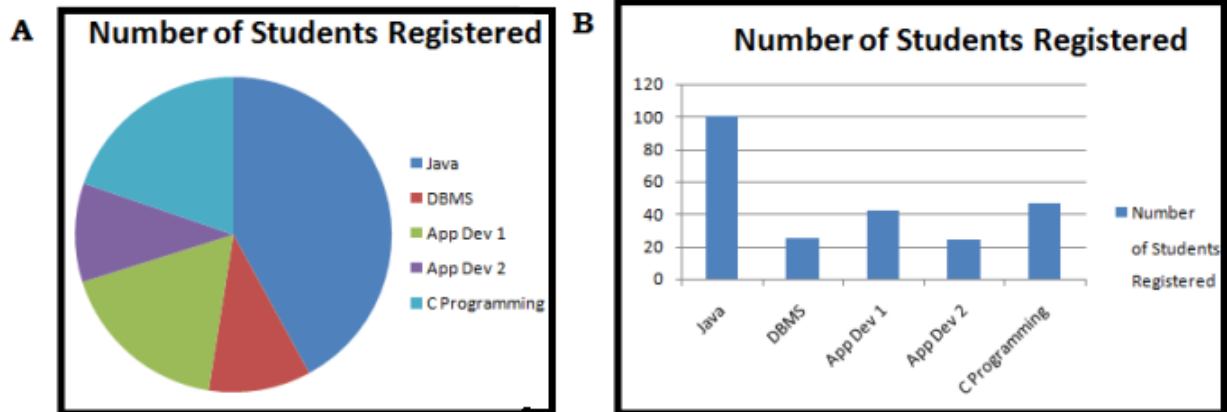
Hence, the 8-bit representation of decimal number “89” is: 01011001.

BSCCS2003: Graded Questions with Solutions

Week 3

1. Consider the images given below and identify the correct statement(s).
[MSQ : 1 point]

Course Name	Number of Students Registered
Java	100
DBMS	25
App Dev 1	42
App Dev 2	24
C Programming	47



- ☒ Model is an object which represents data in the table.
- ☒ Chart A and chart B are two different views of the same data table.
- ☒ Controller is an intermediate between the model and the view.
- ☐ None of the above

Solution:

In MVC design pattern, a model is an application object which can store the application data. The View represents data in specified ways. Controller is the one that manipulates the model and updates the view.

2. Consider the pyhtml code given below and identify the resulting HTML code. [MCQ : 2 points]

```
from pyhtml import *  
  
t = html(  
    head(  
        title('Sample Pyhtml File')
```

```

    ),
    body(
        header(img(src='./logo.png'))
    )
)
print (t.render())

```

```

✓ <!DOCTYPE html>
<html>
  <head>
    <title>
      Sample Pyhtml File
    </title>
  </head>
  <body>
    <header>
      
    </header>
  </body>
</html>

```

```

○ <!DOCTYPE html>
<html>
  <head>
    <title>
      Awesome website
    </title>
    <script src="http://path.to/script.js"></script>
    <title>
      Sample Pyhtml File
    </title>
  </head>
  <body>
    <header>
      
    </header>
  </body>
</html>

```

```

○ <head>
  <title>
  </title>
</head>
<body>
  <header>

```

```

        
    </header>
</body>
</html>

```

☐ None of the above

Solution:

Option 1 : The first code snippet will be the output of given template code.

Option 2 : An additional script tag is included which is not defined in the template code.

Option 3: The title is missing in the output code.

3. What will be the output of the following Python code if rendered using a browser?

```

def Generate(t1):
    begin = "<!DOCTYPE html>\n<html>\n<body>\n"+t1+"\n</body>\n</html>"
    return begin
def div(head,body):
    return "<div>"+head+"\n"+body+ "\n</div>"
def H1(content):
    return "<h1>"+content+"</h1>"
def p(content):
    return "<p>"+content+"</p>"
Out = Generate(div(H1("This is my heading"),
    p("This is my paragraph")))

```

[MCQ: 2 points]

This is my heading

✓ This is my paragraph

This is my paragraph

☐ This is my heading

This is my paragraph

☐ This is my heading

This is my paragraph

This is my heading

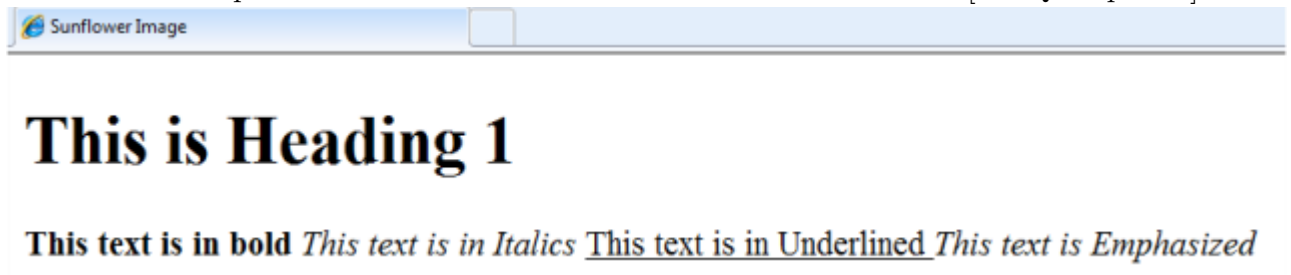


Solution: The given python code will be rendered into the HTML file given below:

```
<!DOCTYPE html>
<html>
<body>
<div><H1>This is my heading</H1>
<p>This is my paragraph</p>
</div>
</body>
</html>
```

The HTML file will display the webpage as given in option 1.

4. Consider the image given below and identify the correct pyhtml code to generate equivalent HTML output. [MCQ : 2 points]



```
✓ from pyhtml import *

t = html(
    head(
        title('Sunflower Image')
    ),
    body(
        h1('This is Heading 1'),
        b('This text is in bold'),
        i('This text is in Italics'),
        u('This text is in Underlined'),
        em('This text is Emphasized')
```

- ```
)
)

print (t.render())
```
- ☐ from pyhtml import \*
- ```
t = html(
    head(
        title('Sunflower Image')
    ),
    body(
        h1('This is Heading 1'),
        b('This text is in bold'),
        i('This text is in Italics'),
        u('This text is in Underlined'),
        em('This text is Emphasized')
    )
)
```
- ```
print (t.show())
```
- ☐ from pyhtml import \*
- ```
t = html(
    head(
        title('All tags')
    ),
    body(
        h1('This is Heading 1'),
        b('This text is in bold'),
        i('This text is in Italics'),
        u('This text is in Underlined'),
        em('This text is Emphasized')
    )
)
```
- ```
print (t.display())
```
- ☐ None of the above

**Solution:**

Option 1: The code here is a valid code and will result in correct output without any errors.



Option 2: The code snippet here is similar to option 1 except that it uses `t.show()` method instead of `t.render()` which is not a valid pyhtml rendering method.

Option 3: The code snippet here is similar to option 1 except that it uses `t.display()` method instead of `t.render()` which is not a valid pyhtml rendering method.

5. What will be the output of the following Python code?

[MCQ: 3 points]

```
from jinja2 import Template
my_statement = Template("The special numbers are: {% for n in range(11)
 if n%2 == 0 %} {{n%3}} " "{% endfor %}")
out = my_statement.render()
print(out)
```

- ☐ The special numbers are: 1 0 1 0 1 0 1 0 1 0 1 0
- ☒ The special numbers are: 0 2 1 0 2 1
- ☐ The special numbers are: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
- ☐ The special numbers are: 0.33 0.67 1.0 1.33 1.67 2.0

**Solution:** In the Template function, the {% %} is a block used to provide conditional statements and the content to be printed is given inside {{ }}. In Python, the expression n%3 will return the remainder when n is divided by 3.

6. What will be the output of following Python code?

[MCQ: 1 point]

```
from jinja2 import Template
statement1 = Template("IIT Madras provides diploma in {{Value_1}} {{Value_2}}")
statement2 = Template("IIT Madras provides degree in {{Value_1}}{{Value_2}}")
out1 = statement1.render(Value_1 = "programming")
out2 = statement2.render(Value_2 = "data science")
print(out1)
print(out2)
```

- ☒ IIT Madras provides diploma in programming  
IIT Madras provides degree in data science
- ☐ IIT Madras provides diploma in data science  
IIT Madras provides degree in programming
- ☐ IIT Madras provides diploma in programming, data science  
IIT Madras provides degree in programming, data science
- ☐ The code will generate parsing error.

**Solution:** The Template class of Jinja2 simply ignores those brackets whose actual content is not provided by the render method. It does not throw any error.

7. Which of the following Python codes will generate the HTML code given below? [MCQ : 3 points]

```
<!DOCTYPE html>
<html>
 <head></head>
 <body>
 <h1>
 Heading 1
 </h1>

 My name is ram

 bold

 <div>
 <h2>
 Heading 2
 </h2>
 <div>
 This is a nested div section
 </div>
 </div>
 <div>
 <h3>
 Heading 3
 </h3>
 <p>
 This is a paragraph
 </p>
 </div>
 </body>
</html>
```

```
✓ import pyhtml as ht
 t=ht.html(ht.head(),
 ht.body(
 ht.h1('Heading 1'),ht.em('My name is ram'),ht.strong("bold"),
 ht.div(ht.h2("Heading 2"),
 ht.div("This is a nested div section")),
 ht.div(ht.h3('Heading 3'),
 ht.p("This is a paragraph")),
```

```
))
print(t.render())
```

- ☐ import pyhtml as ht  
t=ht.html(ht.head(),  
ht.body(  
    ht.h1('Heading 1') ht.em('My name is ram') ht.strong("bold")),  
    ht.div(ht.h2("Heading 2"),  
    ht.div("This is a nested div section")),  
    ht.div(ht.h3('Heading 3'),  
    ht.p("This is a paragraph")),  
)  
print(t.render())
- ☐ import pyhtml as ht  
t=ht.html(ht.head()  
ht.body(  
    ht.h1('Heading 1'),ht.em('My name is ram'),ht.strong("This is bold"),  
    ht.div(ht.h2("Heading 2"),  
    ht.div("This is a nested div section")),  
    ht.div(ht.h3('Heading 3'),  
    ht.p("This is a paragraph")),  
))  
print(t.render())
- ☐ None of the above

**Solution:** This question is based on the Python library called pyhtml to generate a valid HTML file using Python. (Reference: Timeframe 3:40 in Lecture 3.6, Tools-part II)

## BSCCS2003: Graded Questions with Solutions

### Week 4

1. Consider the following two tables: [MCQ : 1 point]

Table 1: Instructors

Instructor_ID	Instructor_Name	Department_Name
101	Amit Dubey	Physics
102	Sarthak Gaur	English
103	Neha Sharma	English
104	Sumit Kumar	Chemistry
105	Himanshi Mehra	Mathematics

Table 2: Departments

Department_Name	Building_Name
English	B1
Mathematics	B2
Physics	B3
Chemistry	B2
Finance	B5

Which of the following queries will list the names of those instructors whose department is “English” or whose building is either ‘B1’ or ‘B2’?

- ☐ SELECT Instructor\_Name from Instructors i, Departments d  
WHERE d.Department\_Name = i.Department\_Name  
and (i.Department\_Name = ‘English’ or d.Building\_Name = ‘B1’) and d.Building\_Name = ‘B2’;
- ☐ SELECT Instructor\_Name from Instructors i, Departments d  
WHERE (i.Department\_Name = ‘English’ or d.Building\_Name in (‘B1’, ‘B2’));
- ✓ ☒ SELECT Instructor\_Name from Instructors i, Departments d  
WHERE d.Department\_Name = i.Department\_Name  
and (i.Department\_Name = ‘English’ or d.Building\_Name in(‘B1’, ‘B2’));
- ☐ All of the above

#### **Solution:**

Option 1: The first query will result in no records.

Option 2: The second query will result in a Cartesian product and generate wrong output.

Option 3: The third query will result in the correct result, i.e., instructors names who belong to “English” department or whose building is either ‘B1’ or ‘B2’.

2. Consider the following two tables: [MCQ : 1 point]

Table 1: Instructors

Instructor_ID	Instructor_Name	Department_Name
101	Amit Dubey	Physics
102	Sarthak Gaur	English
103	Neha Sharma	English
104	Sumit Kumar	Chemistry
105	Himanshi Mehra	Mathematics

Table 2: Departments

Department_Name	Building_Name
English	B1
Mathematics	B2
Physics	B3
Chemistry	B2
Finance	B5

Which of the following queries will list the names of those instructors whose department is in the building 'B1'?

- ☒ `SELECT Instructor_Name from Instructors i INNER JOIN Departments d  
ON i.Department_Name = d.Department_Name  
WHERE d.Building_Name = 'B1';`
- ☐ `SELECT Instructor_Name from Instructors i INNER JOIN Departments d  
ON i.Department_Name = d.Building_Name  
WHERE d.Building_Name = 'B1';`
- ☐ `SELECT Instructor_Name from Instructors i INNER JOIN Departments d  
ON i.Department_Name = d.Department_Name  
WHERE i.Building_Name = 'B1';`
- ☐ All of the above

**Solution:**

Option 1: The first query will result "Sarthak Gaur" and "Neha Sharma" as an inner join will be performed over a common column named "Department\_Name" in both of the tables.

Option 2: The second query will show no results, as there is no entry in the "Instructors" table whose "Department\_Name" matches with the column "Building\_Name" in table "Departments".

Option 3: The third query will generate an error, as there is no attribute called "Building\_Name" in the table "Instructors".

3. Is it mandatory for a table to have a primary key? [MCQ: 1 point]

- ☐ Yes, because each table is uniquely identified by its primary key.
- ✓ ☒ No, because databases can have tables with all non-unique fields, they can exist even without a primary key.
- ☐ Yes, because each table should have a field with unique entries.
- ☐ No, as the primary key is automatically set by the table if not given explicitly.

**Solution:** It is not necessary for a table to have a primary key, as tables can be designed with no primary key set. A primary key does not define any table uniquely in the database, but can define a field or a group of fields collectively within the table. Primary keys are set by the user or the creator of the table, and is not automatically set by the table in case it is not set by the creator.

4. Consider the following 2 tables:

Table 1: Employee

Employee_ID	Employee_Name	Age	PhoneNo
1	Saurav Lokesh	23	9871768118
2	Garima Das	25	9987712611
3	Swaroop Kumar	21	9863674830
4	Sumita Verma	25	9872618731

Table 2 : Project

Project_ID	Employee_ID	Client_ID	Project_Name
101	1	4	Project1
102	2	8	Project2
103	3	3	Project3
104	4	7	Project4

Which of the following queries will pull out all the Project names and Project id with their corresponding Employees names only?

[MCQ : 3 Points]

- ☐ SELECT Employee.Employee\_ID,  
Employee.Employee\_Name, Project.Project\_ID,  
Project.Project\_Name  
FROM Employee  
INNER JOIN Project  
ON Employee.Employee\_ID=Project.Employee\_ID;
- ✓ ☒ SELECT Project.Project\_Name,  
Project.Project\_ID, Employee.Employee\_Name

```
FROM Employee
INNER JOIN Project
ON Employee.Employee_ID=Project.Employee_ID;
```

- ☐ SELECT Employee.Employee\_ID,  
Employee.Employee\_Name, Project.Project\_ID,  
Project.Project\_Name,  
FROM Employee,  
INNER JOIN Project ,  
ON Employee.Employee\_ID=Project.Employee\_ID;
- ☐ None of the above

**Solution:** The correct INNER JOIN syntax is :  
SELECT column\_name(s)  
FROM table1  
INNER JOIN table2  
ON table1.column\_name = table2.column\_name;

In option (i) and (iii) this syntax is violated.



5. Consider the following tables.

[MCQ : 1 point]

1) Table 1: records

record_id	matches	runs	highest_score	format	average	player_id
1	39	2679	212	test	46.19	1
2	227	9206	264	odi	48.96	1
3	92	7547	254	test	52.05	2
4	254	12169	183	odi	59.07	2
5	114	8765	278	test	50.66	3
6	228	9577	176	odi	53.55	3
7	77	7540	239	test	61.8	4
8	128	4378	164	odi	43.35	4
9	86	7311	335	test	48.1	5
10	128	5455	179	odi	45.08	5

2) Table 2: players

player_id	country	name	role
1	India	Rohit Sharma	opening_batsman
2	India	Virat Kohli	middle_order_batsman
3	South Africa	AB de Villiers	middle_order_batsman
4	Australia	Steven Smith	middle_order_batsman
5	Australia	David Warner	opening_batsman

What will be the output of the following code?

```
SELECT players.country
FROM players
INNER JOIN records ON records.player_id = players.player_id
GROUP BY country
ORDER BY SUM(records.runs) DESC
LIMIT 1;
```

☒ India

☐ Australia

☐ South Africa

☐ Code will produce an error

**Solution:** The query will produce the name of the country with the highest aggregate runs. In this case, it is India.

6. Consider the following tables.

[MCQ : 2 points]

1) Table 1: records

record_id	matches	runs	highest_score	format	average	player_id
1	39	2679	212	test	46.19	1
2	227	9206	264	odi	48.96	1
3	92	7547	254	test	52.05	2
4	254	12169	183	odi	59.07	2
5	114	8765	278	test	50.66	3
6	228	9577	176	odi	53.55	3
7	77	7540	239	test	61.8	4
8	128	4378	164	odi	43.35	4
9	86	7311	335	test	48.1	5
10	128	5455	179	odi	45.08	5

2) Table 2: players

player_id	country	name	role
1	India	Rohit Sharma	opening_batsman
2	India	Virat Kohli	middle_order_batsman
3	South Africa	AB de Villiers	middle_order_batsman
4	Australia	Steven Smith	middle_order_batsman
5	Australia	David Warner	opening_batsman

What will be the output of following code?

```
SELECT players.name
FROM players
INNER JOIN records ON records.player_id = players.player_id
WHERE players.role = "opening_batsman" and records.format = "odi"
ORDER BY records.highest_score DESC
LIMIT 1;
```

✓ Rohit Sharma

- ☐ AB de Villiers
- ☐ Virat Kohli
- ☐ David warner

**Solution:** The query will produce the name of the player with highest “highest\_score” in odi and who is also an opening batsman.

7. Consider the following tables.

[MCQ : 3 points]

1) Table 1: records

record_id	matches	runs	highest_score	format	average	player_id
1	39	2679	212	test	46.19	1
2	227	9206	264	odi	48.96	1
3	92	7547	254	test	52.05	2
4	254	12169	183	odi	59.07	2
5	114	8765	278	test	50.66	3
6	228	9577	176	odi	53.55	3
7	77	7540	239	test	61.8	4
8	128	4378	164	odi	43.35	4
9	86	7311	335	test	48.1	5
10	128	5455	179	odi	45.08	5

2) Table 2: players

player_id	country	name	role
1	India	Rohit Sharma	opening_batsman
2	India	Virat Kohli	middle_order_batsman
3	South Africa	AB de Villiers	middle_order_batsman
4	Australia	Steven Smith	middle_order_batsman
5	Australia	David Warner	opening_batsman

Which of the following queries will output the names of batsmen with the top three averages in test matches and has played more than 75 test matches?

- ☐

```
SELECT players.name
FROM players
INNER JOIN records ON records.player_id = players.player_id
ORDER BY records.average
```

```
WHERE records.matches > 75 and records.format = "test"
LIMIT 3;
```

- ```
SELECT players.name
FROM players
INNER JOIN records ON records.player_id = players.player_id
WHERE records.matches > 75 and records.format = "test"
ORDER BY records.average
LIMIT 3;
```
- ```
SELECT players.name
FROM players
INNER JOIN records ON records.player_id = players.player_id
ORDER BY records.average DESC
WHERE records.matches > 75 and records.format = "test"
LIMIT 3;
```
- ✓ 

```
SELECT players.name
FROM players
INNER JOIN records ON records.player_id = players.player_id
WHERE records.matches > 75 and records.format = "test"
ORDER BY records.average DESC
LIMIT 3;
```

**Solution:** option 1 and 3 will produce error because WHERE clause should come before the ORDER BY clause.

option 2 will produce the top 3 batsmen with lower average in test matches and has played more than 75 test matches.

option 4 will produce the top 3 batsmen with higher average in test matches and has played more than 75 test matches.

<p>BSCCS2003: Graded Questions with Solutions</p> <p>Week 5</p>
-----------------------------------------------------------------

1. What will the output of the following Python code? [MCQ : 3 Points]

```
def decor(func1):
 def inner():
 s=func1()
 return s.upper()
 return inner

def decor1(func2):
 def wrapper():
 s=func2()
 return s.split()
 return wrapper

def decor2(func3):
 def wrapper1():
 s=func3()
 return s.lower()
 return wrapper1

@decor1
@decor
@decor2
def print_s():
 return "hello world!"

print(print_s())
```

- ☐ Hello World!
- ☐ HELLO WORLD!
- ☒ ['HELLO', 'WORLD!']
- ☐ None of the above

**Solution:** The above code prints ['HELLO', 'WORLD!'].

Here decor2 function is not changing any functionality as the print\_s function is already in the lowercase.

After that, decor() function converts "hello world!" to "HELLO WORLD!" and then decor1() function converts "HELLO WORLD!" to ["HELLO", "WORLD!"].

2. Consider the code segment given below and choose the correct option(s). [MSQ: 2 points]

```
def My_func1(a,b):
 sum1 = a+b
 print(sum1)

def update(original_func):
 def My_func2(*args):
 My_func1(*args)
 a,b = args
 print((a+b)**2)
 return My_func2

My_func_1 = update(My_func1)
```

- ✓ 'My\_func1' prints the sum of numbers a and b.
- ✓ 'My\_func\_1' prints the sum, and also the square of the sum of numbers a and b.
- ✓ The function 'update' works in a way Python decorators work
- ✓ when "My\_func\_1 = update(My\_func1)" is executed, 'My\_func2' is assigned to 'My\_func\_1'.

**Solution:** The function 'update' alters the functionality of function 'My\_func1' such that it returns the sum and also the square of the resulting sum. Thus, the equation: My\_func\_1 = update(My\_func1) works in the way a decorator works.

3. The default 'methods' parameter in the route decorator is\_\_\_\_\_. [MCQ: 1 points]

- ☐ POST
- ✓ ☒ GET
- ☐ UPDATE
- ☐ CREATE

**Solution:** The parameter 'methods' of the route method accepts a list of methods that the given rule is limited to. By default, it listens to the 'GET' method.

4. Which of the following is/are correct regarding the URL? [MSQ : 1 points]

"http://www.example.com/student/marks.html?id=201"

- ☐ www.example.com is a query string.
- ✓ /student/marks.html is the path to the resource.
- ✓ id = 201 is a parameter.
- ✓ www.example.com is a domain name.

**Solution:** In this URL, example.com is domain name, /student/marks.html is path to the resource and id = 201 is a parameter.

5. Consider the following code.

[MCQ : 2 points]

```
from flask import Flask
app = Flask(__name__)

@app.route("/")
def ind():
 return "Hello students !"

@app.route("/home/<name>")
def home(name):
 return f"Hello {name} students!"
```

If the flask application is running on http://127.0.0.1:5000, what will browser render for url http://127.0.0.1:5000/home/iitm?

- ☐ Hello iitm!
- ☐ Hello students!
- ✓ Hello iitm students!
- ☐ Hello world!

**Solution:** If you visit the url “http://127.0.0.1:5000/home/iitm” flask will invoke home function which will return Hello iitm students!

6. A Python code with a Flask app and two HTML files in the template folder are shown below.

```
from flask import Flask, render_template
app = Flask(__name__)
@app.route('/index')
def info():
 return render_template('web1.html')
```

```
@app.route('/info')
def index():
 return render_template('web2.html')
```

```
if __name__ == '__main__':
 app.run(debug = True)
```

HTML file: web1.html

```
<!DOCTYPE html>
<html>
<head>
<title>Web 1</title>
</head>
<body>
<h3>This is the index page of my website</h3>
<p>This page gives introduction of the website.</p>
</body>
</html>
```

HTML file: web2.html

```
<!DOCTYPE html>
<html>
<head>
<title>Web 2</title>
</head>
<body>
<h3>This is the info page of my website</h3>
<p>This page gives information of the website.</p>
</body>
</html>
```

Choose the correct statement(s)

[MCQ : 3 points]

- ✓ For the URL 'http://127.0.0.1:5000/index', the browser will render the HTML file as;



**This is the index page of my website**

This page gives introduction of the website.

- For the URL 'http://127.0.0.1:5000/index', the browser will render the HTML file as;

**This is the info page of my website**

This page gives information of the website.

- For the URL 'http://127.0.0.1:5000/info', the browser will render the HTML file as;

**This is the index page of my website**

This page gives introduction of the website.

- ✓ For the URL 'http://127.0.0.1:5000/info', the browser will render the HTML file as;

**This is the info page of my website**

This page gives information of the website.

**Solution:** The HTML file rendered by the browser depends on the route method. The route method with endpoint '/index' will render HTML file 'web1.html' and that with endpoint '/info' will render HTML file 'web2.html'. For the flask app to run without error, the name of functions under the decorator should have different names, and these names are independent of the rendered HTML file.

7. A model class 'Users' is used to create a table with name 'users' in the database, which is shown in the figure below.

id	user_name	e_mail_id
1	Shiv	<a href="mailto:shiv@example.com">shiv@example.com</a>
2	Rudra	<a href="mailto:rudra@example.org">rudra@example.org</a>
3	Mahesh	<a href="mailto:mahesh@example.com">mahesh@example.com</a>
4	Neel	<a href="mailto:neel@example.org">neel@example.org</a>

What will be the output if the following lines of code are executed with help of Python console?

```
>>> Names = Users.query.order_by(Users.user_name).all()
>>> for name in Names:
... print(name.user_name)
```

[MCQ : 2 points]

- ☐ Shiv  
Rudra  
Mahesh  
Neel
- ☐ Rudra  
Shiv  
Mahesh  
Neel
- ☒ Mahesh  
Neel  
Rudra  
Shiv
- ☐ mahesh  
neel  
rudra  
shiv

**Solution:** The 'query.order\_by()' method sorts all the records in the 'users' table with respect to the field passed to it as an argument. In this case, it will sort the table with respect to user\_name. The following 'for' loop prints the alphabetically sorted user\_names in newline.

<p>BSCCS2003: Graded Questions with Solutions</p> <p>Week 6</p>
-----------------------------------------------------------------

1. REST APIs are 'stateless', with keeping that in mind, which of the following statements is/are true? [MSQ : 2 Points]

- ✓ Every request from the client is independent of one another, i.e., the request runs independently of other requests from the same client.
- ✓ The client cannot assume state of the server.
- ✓ The server need not maintain the client's previous interaction.
- ☐ Sometimes, the server can take advantage of any previously stored context information on the server.

**Solution:** Option 4) The server cannot take advantage of any previously stored information on the server, as in REST API, statelessness means that every HTTP request happens in complete isolation. They should not keep a client state on the server and vice versa.

2. Which of the following is/are true regarding POST HTTP method? [MSQ : 3 points]

- ☐ It should be safe in context of REST.
- ☐ It should be idempotent in context of REST.
- ✓ It is allowed in HTML forms.
- ✓ POST Request has a body.

**Solution:** An HTTP method is safe if it does not change the state of the server. POST request is used to create a resource. It changes the state of the server, so it is not safe. It is not idempotent because multiple identical POST request can create multiple resources. It is allowed in the HTML forms. And POST request has a body.

3. For an API, which of the following can be an output? [MCQ: 2 points]

- ✓ JSON
- ✓ XML
- ✓ YAML
- ✓ CSV

**Solution:** The most common outputs of an API are JSON, XML and YAML. JSON is most popular as most APIs give JSON as output. APIs can produce CSV as the output, but a CSV file is not a standard output, and they might lack in structure.

4. Which of the following come(s) under authenticated APIs in the context of the CoWin website? [MSQ : 2 Points]

- ☐ state-wise search of positive cases.
- ☐ district-wise search for medicine.
- ✓ ☒ booking appointment for vaccination.
- ✓ ☒ download vaccination certificate.

**Solution:** The authentication APIs enable us to manage and control all the aspects of user identity. Booking an appointment or downloading a certificate on CoWin website requires mobile OTP to authenticate the user. Retrieving general information will come under unauthenticated APIs.

5. Consider the following YAML file.

```
openapi: 3.1.0
info:
 title: A minimal OpenAPI document
 version: 0.0.1
paths: {}
```

How many endpoints are defined in the given YAML file? [MCQ: 1 points]

- ✓ ☒ 0
- ☐ 1
- ☐ 2
- ☐ 3

**Solution:** Empty curly braces corresponding to 'paths' denote null array and state that no endpoint has been defined for given OpenAPI.

6. In the context of REST, a DELETE request that deletes a random resource in the database will be \_\_\_\_\_. [MCQ: 3 points]

- ☐ idempotent
- ✓ ☒ not idempotent
- ☐ safe
- ☐ All of the above

**Solution:** A DELETE request of a random resource from the database is a violation of REST principles.

7. Which of the following is an invalid JSON object? [MCQ : 1 Points]

- ☐ {  
    "Year" : "2020",  
    "Month" : 4,  
    "Date" : 19  
}
- ☐ {  
    "Year" : 2016,  
    "Month" : "7",  
    "Date" : 28  
}
- ✓ ☒ {  
    "Year" : "2007",  
    "Month" : 2,  
    "Date" : NULL  
}
- ☐ None of the above

**Solution:** A JSON object is a collection of key : value pairs, where a key must be a string and value can be a number, string, object, array, true, false, array or null. NULL is not a valid value, but null is a valid JSON value.

## Week 7 Graded Questions with Solutions

1] You write an algorithm to sort N numbers (stored in an array a[0] to a[N-1]) as follows:

Algorithm steps:

- i. Search through the list of numbers to find the lowest number - say it is position
- ii. Move a[i-1] to a[i], a[i-2] to a[i-1] etc, till a[0] to a[1]
- iii. Place the original a[i] in position 0
- iv. Repeat the above steps but now starting from position 1 to N-1, then 2 to N-1 etc till all numbers are in the correct places.

What is the running complexity of this algorithm?

1. linear
2. quadratic
3. cubic
4. exponential

Answer: Option 2.

Solution: Step 1 can take  $O(N)$  time in worst case (search through all elements). Then step 2 will also take  $O(N)$  time (if i is close to end of the list). But this is total  $2N$  which is still  $O(N)$ . This is done once for each of N numbers, so total algorithm is  $O(N*N)$  or quadratic.

2] Balancing a binary tree is done in order to\_\_.

1. reduce the height of the tree
2. ensure logarithmic searching time
3. make the search time linear
4. reduce the space required for storage.

Answer: Option 1 and 2.

Solution: Reducing the height of the tree and ensuring logarithmic searching time do not have any impact on storage.

3] A binary tree of height H can store a maximum of how many values?

1.  $2^H - 1$
2.  $2^H + 1$
3.  $H^2 - 1$
4.  $H^2 + 1$

Answer: Option 1.

Solution:  $2^H - 1$  (for example, height 5 means 5 steps to root, there will be 16 at the lowest level, 8 above that, 4 above that, 2 above that and then the root).

4] A binary tree is used to store an index of names of people (table NAME). Which of the following queries will be able to make use of the index to speed up the response?

1. NAME LIKE 'RA%';
2. NAME = 'RAHUL' ;
3. NAME LIKE '%DR%';
4. ROLLNO LIKE 'EE%';

Answers: Option 1 and 2.

Solution: The queries NAME LIKE 'RA%' and NAME = 'RAHUL' will make use of the index to speed up the response.

5] If our main interest is in scaling out a database by adding more distributed servers, then which of the ACID conditions is most difficult to meet?

1. A
2. C
3. I
4. D

Answer: Option 2.

Solution: consistency - all the other can be done more easily on a distributed system.  
consistency is hard because there are multiple servers

6] You want to create an app where students can log in and download halltickets. To make this more efficient, you want to have some very quick way to check whether a given user has already downloaded their hallticket or not. Which kind of database will you prefer?

1. RDBMS
2. Doc-oriented database
3. Graph database
4. Key-value store

Answer: Option 4.

Solution: Key-Value stores are usually kept in memory and are very fast at answering Yes/No questions like whether a person has already downloaded their hallticket

7] Which type of database will be worst at scaling out to large number of servers?

1. RDBMS
2. Doc-oriented database
3. Graph database
4. Key-value store

Answer: Option 1.

Solution: RDBMS are usually designed for consistency and do not scale out easily.