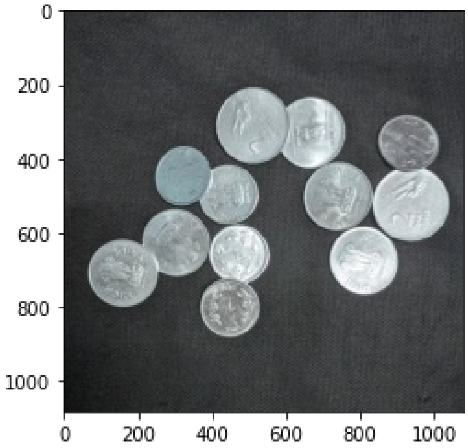
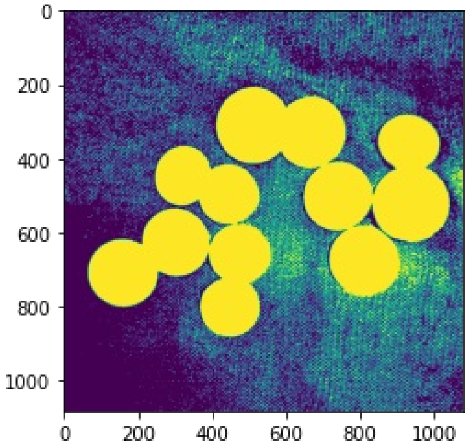
In [75]:

```
import numpy as np
import cv2
from matplotlib import pyplot as plt

img = cv2.imread('coin/img1.jpeg')
gray = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)

ret, thresh = cv2.threshold(gray,70,255,cv2.THRESH_BINARY)

plt.imshow(img)
plt.show()
plt.imshow(thresh)
```



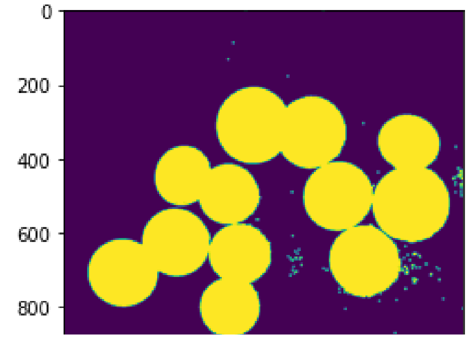
Out[75]:

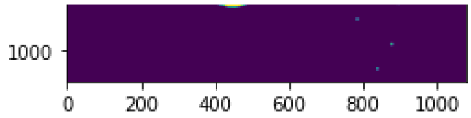
```
<matplotlib.image.AxesImage at 0x7faf39eaf400>
```



In [84]:

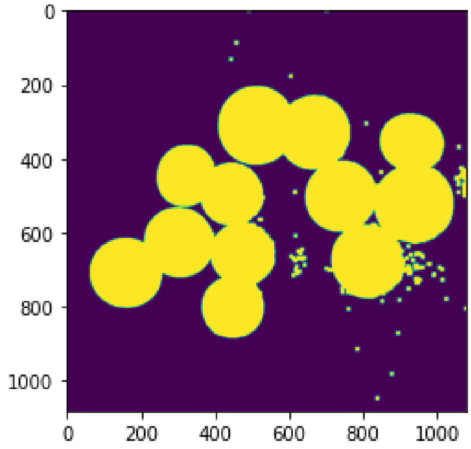
```
# noise removal
kernel = np.ones((3,3),np.uint8)
opening = cv2.morphologyEx(thresh,cv2.MORPH_OPEN,kernel, iterations = 2)
plt.imshow(opening)
plt.show()
```





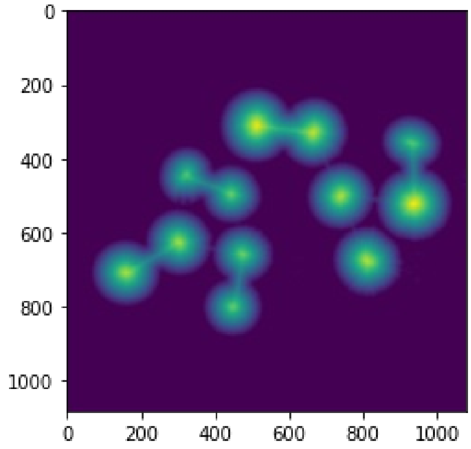
In [85]:

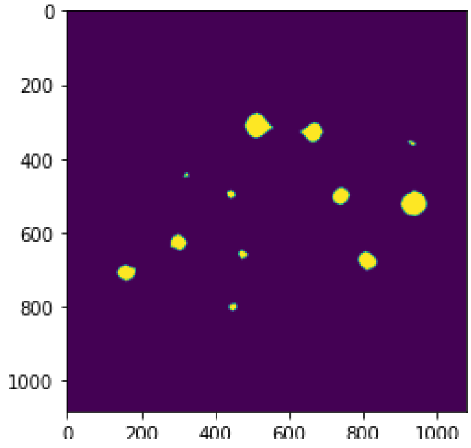
```
# sure background area
sure_bg = cv2.dilate(opening,kernel,iterations=3)
plt.imshow(sure_bg)
plt.show()
```



In [86]:

```
# Finding sure foreground area

dist_transform = cv2.distanceTransform(opening,cv2.DIST_L2,5) #(binary_image, distance_t
ype, mask_size)
ret, sure_fg = cv2.threshold(dist_transform,0.7*dist_transform.max(),255,cv2.THRESH_BINAR
Y)

plt.imshow(dist_transform)
plt.show()
plt.imshow(sure_fg)
plt.show()
```



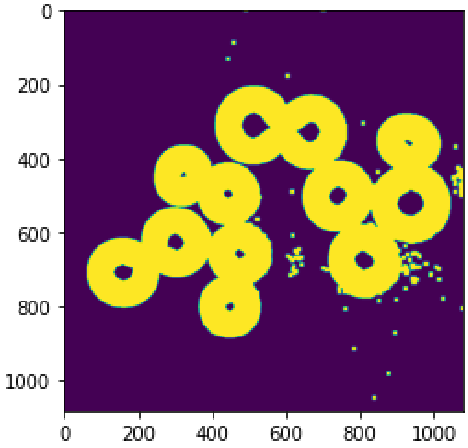


In [87]:

```
# Finding unknown region
sure_fg = np.uint8(sure_fg)
unknown = cv2.subtract(sure_bg,sure_fg)
plt.imshow(unknown)
```

Out[87]:

```
<matplotlib.image.AxesImage at 0x7faf38230b70>
```



In [77]:

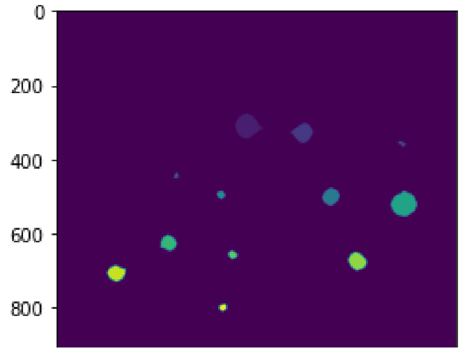
```
'''
The distance transform operator generally takes binary images as inputs.
In this operation, the gray level intensities of the points inside the foreground regions
are changed to
respective distances from the closest 0 value (boundary).
'''
```

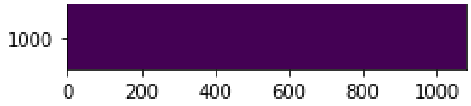
Out[77]:

```
'\nThe distance transform operator generally takes binary images as inputs. \nIn this ope
ration, the gray level intensities of the points inside the foreground regions are change
d to \nrespective distances from the closest 0 value (boundary).\n'
```

In [129]:

```
# Marker labelling
ret, markers = cv2.connectedComponents(sure_fg)
plt.imshow(markers)
plt.show()

res = list(set(i for j in markers for i in j))
# printing result
print ("Unique values in matrix are : " + str(res))


#we dont need entire background to be the valley
markers = markers+1
# Now,we set the unkown region to be the valley
markers[unknown==255] = 0
plt.imshow(markers)
```

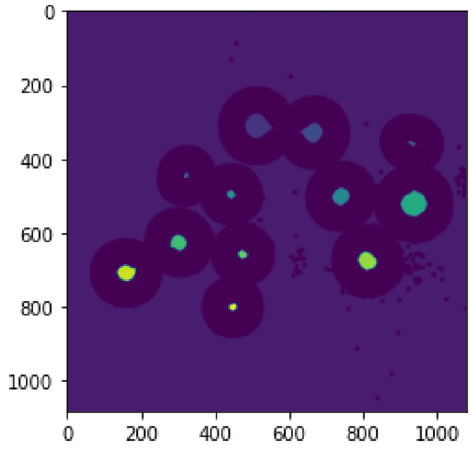




```
Unique values in matrix are : [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12]
```

Out[129]:

```
<matplotlib.image.AxesImage at 0x7faf03cd9208>
```



In [ ]:

```

```

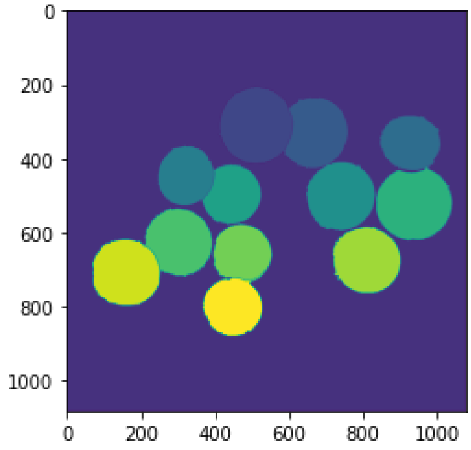
In [130]:

```
markers = cv2.watershed(img,markers)
#print(markers.max())
img[markers == -1] = [255,0,0]
```

```
13
```

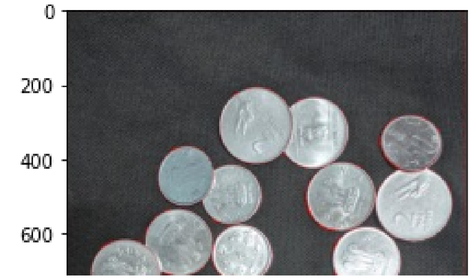
In [131]:

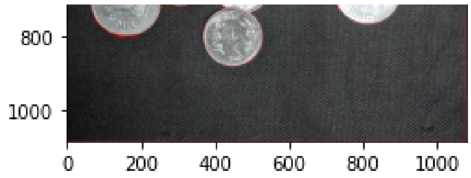
```
plt.imshow(markers)
plt.show()
plt.imshow(img)
```



Out[131]:

```
<matplotlib.image.AxesImage at 0x7faf03d2d2e8>
```





In [118]:

```
# cv2.imshow('im',img)
# cv2.waitKey(0)
# cv2.destroyAllWindows()
```

In [ ]:

In [ ]: