Importing modules

In [1]:

```
import pandas as pd
import numpy as np
import tensorflow as tf
from tensorflow import keras
from keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras import models, layers
```

```
Using TensorFlow backend.
```

ImageDataGenerator

In [2]:

```
dataflow = ImageDataGenerator(
        rescale=1./255,)
```

Train data

In [3]:

```
train = dataflow.flow_from_directory(
        'data/train',
        class_mode='binary')
```

```
Found 40 images belonging to 2 classes.
```

Test Data

In [4]:

```
test = dataflow.flow_from_directory(
        'data/test',
        class_mode='binary')
```

```
Found 21 images belonging to 2 classes.
```

Building Model

Creating Model

In [5]:

```
#Step 2 Build Model
model = models.Sequential()
```

Adding Layers

(Note: For some reason below layers code is not working if combine that is the reason I have spilit in to differnt cells)

In [6]:

```
model.add(layers.Conv2D(32, (5,5), activation='relu', padding='same', input_shape=(256, 256, 3) ))
```

In [7]:

```
#model.add(layers.MaxPooling2D(2,2)))
model.add(layers.MaxPooling2D(2,2))
```

In [8]:

```
model.add(layers.Conv2D(64, (5,5), activation="relu"))
```

In [9]:

```
model.add(layers.MaxPooling2D(2,2))
```

In [10]:

```
model.add(layers.Dropout(0.4))
model.add(layers.Flatten())
model.add(layers.Dense(32, activation="relu"))
model.add(layers.Dense(1, activation="sigmoid"))
```

Optimizers

In [12]:

```
sgd_opt = tf.keras.optimizers.SGD(lr=0.01)
```

Compiling the Model

In [13]:

```
model.compile(optimizer = sgd_opt, loss='binary_crossentropy', metrics=['accuracy'])
```

Fit in the Model

Executing for 100 epochs

In [14]:

```
model.fit(train, validation_data=test, epochs=100)
```

```
WARNING:tensorflow:sample_weight modes were coerced from
  ...
    to
  ['...']
WARNING:tensorflow:sample_weight modes were coerced from
  ...
    to
  ['...']
Train for 2 steps, validate for 1 steps
Epoch 1/100
2/2 [==============================] - 7s 3s/step - loss: 0.6999 - accuracy: 0.4750 - val_loss: 0.72
36 - val_accuracy: 0.4762
Epoch 2/100
2/2 [==============================] - 6s 3s/step - loss: 0.6836 - accuracy: 0.5500 - val_loss: 0.69
67 - val_accuracy: 0.5238
Epoch 3/100
2/2 [==============================] - 6s 3s/step - loss: 0.6779 - accuracy: 0.4500 - val_loss: 0.77
88 - val_accuracy: 0.5238
Epoch 4/100
2/2 [==============================] - 6s 3s/step - loss: 0.7692 - accuracy: 0.4500 - val_loss: 0.68
75 - val_accuracy: 0.5238
Epoch 5/100
2/2 [==============================] - 6s 3s/step - loss: 0.6445 - accuracy: 0.6250 - val_loss: 0.68
85 - val_accuracy: 0.5238
Epoch 6/100
2/2 [==============================] - 6s 3s/step - loss: 0.6329 - accuracy: 0.5750 - val_loss: 0.70
31 - val_accuracy: 0.4762
Epoch 7/100
2/2 [==============================] - 6s 3s/step - loss: 0.6251 - accuracy: 0.6250 - val_loss: 0.71
66 - val_accuracy: 0.4762
Epoch 8/100
2/2 [==============================] - 6s 3s/step - loss: 0.6142 - accuracy: 0.6250 - val_loss: 0.74
55 - val_accuracy: 0.4762
Epoch 9/100
2/2 [==============================] - 6s 3s/step - loss: 0.6268 - accuracy: 0.5750 - val_loss: 0.78
94 - val_accuracy: 0.4762
Epoch 10/100
2/2 [==============================] - 6s 3s/step - loss: 0.6117 - accuracy: 0.6000 - val_loss: 0.77
00 - val_accuracy: 0.4762
Epoch 11/100
2/2 [==============================] - 6s 3s/step - loss: 0.5722 - accuracy: 0.6750 - val_loss: 0.75
10 - val_accuracy: 0.3810
Epoch 12/100
2/2 [==============================] - 6s 3s/step - loss: 0.5339 - accuracy: 0.6750 - val_loss: 0.73
62 - val_accuracy: 0.5238
Epoch 13/100
2/2 [==============================] - 6s 3s/step - loss: 0.4980 - accuracy: 0.7250 - val_loss: 0.75
01 - val_accuracy: 0.5238
Epoch 14/100
2/2 [==============================] - 6s 3s/step - loss: 0.4875 - accuracy: 0.7250 - val_loss: 0.96
70 - val_accuracy: 0.4762
Epoch 15/100
```

```
2/2 [==============================] - 6s 3s/step - loss: 0.7498 - accuracy: 0.5500 - val_loss: 0.91
21 - val_accuracy: 0.4762
Epoch 16/100
2/2 [==============================] - 6s 3s/step - loss: 0.6305 - accuracy: 0.6250 - val_loss: 0.72
11 - val_accuracy: 0.4762
Epoch 17/100
2/2 [==============================] - 6s 3s/step - loss: 0.5127 - accuracy: 0.7750 - val_loss: 0.73
22 - val_accuracy: 0.4762
Epoch 18/100
2/2 [==============================] - 6s 3s/step - loss: 0.4548 - accuracy: 0.8500 - val_loss: 0.75
88 - val_accuracy: 0.4762
Epoch 19/100
2/2 [==============================] - 6s 3s/step - loss: 0.4173 - accuracy: 0.8500 - val_loss: 0.78
91 - val_accuracy: 0.5238
Epoch 20/100
2/2 [==============================] - 6s 3s/step - loss: 0.3926 - accuracy: 0.8250 - val_loss: 0.79
13 - val_accuracy: 0.4286
Epoch 21/100
2/2 [==============================] - 6s 3s/step - loss: 0.3724 - accuracy: 0.8000 - val_loss: 0.81
47 - val_accuracy: 0.4762
Epoch 22/100
2/2 [==============================] - 6s 3s/step - loss: 0.4021 - accuracy: 0.7500 - val_loss: 1.58
21 - val_accuracy: 0.5238
Epoch 23/100
2/2 [==============================] - 6s 3s/step - loss: 0.7901 - accuracy: 0.5500 - val_loss: 0.73
61 - val_accuracy: 0.5714
Epoch 24/100
2/2 [==============================] - 6s 3s/step - loss: 0.4899 - accuracy: 0.8000 - val_loss: 0.73
46 - val_accuracy: 0.5238
Epoch 25/100
2/2 [==============================] - 6s 3s/step - loss: 0.4183 - accuracy: 0.8250 - val_loss: 0.74
62 - val_accuracy: 0.4762
Epoch 26/100
2/2 [==============================] - 6s 3s/step - loss: 0.3641 - accuracy: 0.8750 - val_loss: 0.77
93 - val_accuracy: 0.4762
Epoch 27/100
2/2 [==============================] - 6s 3s/step - loss: 0.3219 - accuracy: 0.8500 - val_loss: 0.82
86 - val_accuracy: 0.4762
Epoch 28/100
2/2 [==============================] - 6s 3s/step - loss: 0.3001 - accuracy: 0.8250 - val_loss: 0.89
42 - val_accuracy: 0.4762
Epoch 29/100
2/2 [==============================] - 6s 3s/step - loss: 0.4882 - accuracy: 0.7500 - val_loss: 1.37
78 - val_accuracy: 0.5238
Epoch 30/100
2/2 [==============================] - 6s 3s/step - loss: 0.5643 - accuracy: 0.7250 - val_loss: 0.73
10 - val_accuracy: 0.4762
Epoch 31/100
2/2 [==============================] - 6s 3s/step - loss: 0.3466 - accuracy: 0.9000 - val_loss: 0.77
98 - val_accuracy: 0.5238
Epoch 32/100
2/2 [==============================] - 6s 3s/step - loss: 0.2891 - accuracy: 0.8750 - val_loss: 0.83
00 - val_accuracy: 0.5238
Epoch 33/100
2/2 [==============================] - 6s 3s/step - loss: 0.2533 - accuracy: 0.8750 - val_loss: 0.86
36 - val_accuracy: 0.4762
Epoch 34/100
2/2 [==============================] - 6s 3s/step - loss: 0.2365 - accuracy: 0.8750 - val_loss: 0.86
24 - val_accuracy: 0.5238
Epoch 35/100
2/2 [==============================] - 6s 3s/step - loss: 0.2268 - accuracy: 0.8750 - val_loss: 0.89
04 - val_accuracy: 0.5238
Epoch 36/100
2/2 [==============================] - 6s 3s/step - loss: 0.2096 - accuracy: 0.9250 - val_loss: 0.93
70 - val_accuracy: 0.4762
Epoch 37/100
2/2 [==============================] - 6s 3s/step - loss: 0.1955 - accuracy: 0.8750 - val_loss: 0.88
39 - val_accuracy: 0.5238
Epoch 38/100
2/2 [==============================] - 6s 3s/step - loss: 0.1823 - accuracy: 0.9250 - val_loss: 0.91
34 - val_accuracy: 0.4762
Epoch 39/100
2/2 [==============================] - 6s 3s/step - loss: 0.2671 - accuracy: 0.9000 - val_loss: 1.92
85 - val_accuracy: 0.5238
Epoch 40/100
2/2 [==============================] - 6s 3s/step - loss: 1.3243 - accuracy: 0.4750 - val_loss: 0.72
94 - val_accuracy: 0.4762
Epoch 41/100
2/2 [==============================] - 6s 3s/step - loss: 0.5876 - accuracy: 0.8000 - val_loss: 0.75
42 - val_accuracy: 0.4762
Epoch 42/100
2/2 [==============================] - 6s 3s/step - loss: 0.5273 - accuracy: 0.8500 - val_loss: 0.79
88 - val_accuracy: 0.4762
```

```
Epoch 43/100
2/2 [==============================] - 6s 3s/step - loss: 0.4642 - accuracy: 0.8000 - val_loss: 0.82
18 - val_accuracy: 0.3810
Epoch 44/100
2/2 [==============================] - 6s 3s/step - loss: 0.4044 - accuracy: 0.9250 - val_loss: 0.89
38 - val_accuracy: 0.4762
Epoch 45/100
2/2 [==============================] - 6s 3s/step - loss: 0.3866 - accuracy: 0.8000 - val_loss: 1.02
56 - val_accuracy: 0.4762
Epoch 46/100
2/2 [==============================] - 6s 3s/step - loss: 0.4327 - accuracy: 0.6750 - val_loss: 0.89
69 - val_accuracy: 0.4762
Epoch 47/100
2/2 [==============================] - 6s 3s/step - loss: 0.3314 - accuracy: 0.8000 - val_loss: 0.92
13 - val_accuracy: 0.4762
Epoch 48/100
2/2 [==============================] - 6s 3s/step - loss: 0.2683 - accuracy: 0.9500 - val_loss: 0.98
87 - val_accuracy: 0.4762
Epoch 49/100
2/2 [==============================] - 6s 3s/step - loss: 0.3137 - accuracy: 0.9000 - val_loss: 1.01
95 - val_accuracy: 0.4762
Epoch 50/100
2/2 [==============================] - 7s 3s/step - loss: 0.2383 - accuracy: 0.9000 - val_loss: 1.09
55 - val_accuracy: 0.4762
Epoch 51/100
2/2 [==============================] - 6s 3s/step - loss: 0.2189 - accuracy: 0.9000 - val_loss: 1.02
69 - val_accuracy: 0.4286
Epoch 52/100
2/2 [==============================] - 6s 3s/step - loss: 0.1762 - accuracy: 0.9750 - val_loss: 0.99
46 - val_accuracy: 0.4762
Epoch 53/100
2/2 [==============================] - 6s 3s/step - loss: 0.1427 - accuracy: 0.9500 - val_loss: 1.02
09 - val_accuracy: 0.4762
Epoch 54/100
2/2 [==============================] - 6s 3s/step - loss: 0.1357 - accuracy: 0.9500 - val_loss: 1.05
95 - val_accuracy: 0.5714
Epoch 55/100
2/2 [==============================] - 6s 3s/step - loss: 0.1409 - accuracy: 0.9500 - val_loss: 1.00
01 - val_accuracy: 0.5238
Epoch 56/100
2/2 [==============================] - 6s 3s/step - loss: 0.1166 - accuracy: 1.0000 - val_loss: 1.04
47 - val_accuracy: 0.5238
Epoch 57/100
2/2 [==============================] - 6s 3s/step - loss: 0.1116 - accuracy: 1.0000 - val_loss: 1.01
53 - val_accuracy: 0.5238
Epoch 58/100
2/2 [==============================] - 6s 3s/step - loss: 0.0944 - accuracy: 0.9750 - val_loss: 1.00
74 - val_accuracy: 0.5238
Epoch 59/100
2/2 [==============================] - 6s 3s/step - loss: 0.0896 - accuracy: 0.9750 - val_loss: 1.02
04 - val_accuracy: 0.5238
Epoch 60/100
2/2 [==============================] - 6s 3s/step - loss: 0.0861 - accuracy: 1.0000 - val_loss: 1.08
86 - val_accuracy: 0.6190
Epoch 61/100
2/2 [==============================] - 6s 3s/step - loss: 0.0841 - accuracy: 0.9750 - val_loss: 1.11
22 - val_accuracy: 0.4762
Epoch 62/100
2/2 [==============================] - 6s 3s/step - loss: 0.6707 - accuracy: 0.8250 - val_loss: 2.38
26 - val_accuracy: 0.5238
Epoch 63/100
2/2 [==============================] - 6s 3s/step - loss: 0.9854 - accuracy: 0.5250 - val_loss: 0.67
73 - val_accuracy: 0.6190
Epoch 64/100
2/2 [==============================] - 6s 3s/step - loss: 0.5133 - accuracy: 0.6750 - val_loss: 0.70
76 - val_accuracy: 0.5714
Epoch 65/100
2/2 [==============================] - 6s 3s/step - loss: 0.3991 - accuracy: 0.8500 - val_loss: 0.72
93 - val_accuracy: 0.5714
Epoch 66/100
2/2 [==============================] - 6s 3s/step - loss: 0.3082 - accuracy: 0.9250 - val_loss: 0.89
80 - val_accuracy: 0.4762
Epoch 67/100
2/2 [==============================] - 6s 3s/step - loss: 0.3015 - accuracy: 0.9000 - val_loss: 1.32
84 - val_accuracy: 0.4762
Epoch 68/100
2/2 [==============================] - 6s 3s/step - loss: 0.5414 - accuracy: 0.6000 - val_loss: 1.58
59 - val_accuracy: 0.4762
Epoch 69/100
2/2 [==============================] - 6s 3s/step - loss: 0.8249 - accuracy: 0.6250 - val_loss: 0.74
33 - val_accuracy: 0.4762
Epoch 70/100
2/2 [==============================] - 6s 3s/step - loss: 0.4005 - accuracy: 0.9250 - val_loss: 0.82
```

```
35 - val_accuracy: 0.4286
Epoch 71/100
2/2 [==============================] - 6s 3s/step - loss: 0.2774 - accuracy: 0.9000 - val_loss: 0.90
04 - val_accuracy: 0.5714
Epoch 72/100
2/2 [==============================] - 6s 3s/step - loss: 0.2080 - accuracy: 0.9750 - val_loss: 0.97
88 - val_accuracy: 0.5714
Epoch 73/100
2/2 [==============================] - 6s 3s/step - loss: 0.1697 - accuracy: 0.9500 - val_loss: 1.02
29 - val_accuracy: 0.5714
Epoch 74/100
2/2 [==============================] - 6s 3s/step - loss: 0.1596 - accuracy: 0.9750 - val_loss: 1.09
61 - val_accuracy: 0.4286
Epoch 75/100
2/2 [==============================] - 6s 3s/step - loss: 0.1627 - accuracy: 0.9000 - val_loss: 1.08
17 - val_accuracy: 0.5714
Epoch 76/100
2/2 [==============================] - 6s 3s/step - loss: 0.1273 - accuracy: 0.9500 - val_loss: 1.07
45 - val_accuracy: 0.5714
Epoch 77/100
2/2 [==============================] - 6s 3s/step - loss: 0.1094 - accuracy: 0.9500 - val_loss: 1.10
72 - val_accuracy: 0.5238
Epoch 78/100
2/2 [==============================] - 6s 3s/step - loss: 0.1222 - accuracy: 0.9500 - val_loss: 1.08
05 - val_accuracy: 0.5714
Epoch 79/100
2/2 [==============================] - 6s 3s/step - loss: 0.0994 - accuracy: 1.0000 - val_loss: 1.13
79 - val_accuracy: 0.5238
Epoch 80/100
2/2 [==============================] - 6s 3s/step - loss: 0.0889 - accuracy: 0.9500 - val_loss: 1.18
67 - val_accuracy: 0.5714
Epoch 81/100
2/2 [==============================] - 6s 3s/step - loss: 0.0786 - accuracy: 1.0000 - val_loss: 1.11
78 - val_accuracy: 0.5714
Epoch 82/100
2/2 [==============================] - 6s 3s/step - loss: 0.0771 - accuracy: 1.0000 - val_loss: 1.14
78 - val_accuracy: 0.5238
Epoch 83/100
2/2 [==============================] - 6s 3s/step - loss: 0.0771 - accuracy: 0.9750 - val_loss: 1.12
59 - val_accuracy: 0.5714
Epoch 84/100
2/2 [==============================] - 6s 3s/step - loss: 0.0725 - accuracy: 1.0000 - val_loss: 1.18
00 - val_accuracy: 0.5714
Epoch 85/100
2/2 [==============================] - 6s 3s/step - loss: 0.1061 - accuracy: 0.9500 - val_loss: 1.31
33 - val_accuracy: 0.5238
Epoch 86/100
2/2 [==============================] - 6s 3s/step - loss: 0.2147 - accuracy: 0.9000 - val_loss: 2.10
42 - val_accuracy: 0.5238
Epoch 87/100
2/2 [==============================] - 6s 3s/step - loss: 0.1549 - accuracy: 1.0000 - val_loss: 1.14
79 - val_accuracy: 0.5714
Epoch 88/100
2/2 [==============================] - 6s 3s/step - loss: 0.0737 - accuracy: 0.9750 - val_loss: 1.14
70 - val_accuracy: 0.5714
Epoch 89/100
2/2 [==============================] - 6s 3s/step - loss: 0.0676 - accuracy: 1.0000 - val_loss: 1.25
61 - val_accuracy: 0.6190
Epoch 90/100
2/2 [==============================] - 6s 3s/step - loss: 0.0742 - accuracy: 0.9750 - val_loss: 1.25
54 - val_accuracy: 0.4762
Epoch 91/100
2/2 [==============================] - 6s 3s/step - loss: 0.0855 - accuracy: 1.0000 - val_loss: 1.64
12 - val_accuracy: 0.4762
Epoch 92/100
2/2 [==============================] - 6s 3s/step - loss: 0.1339 - accuracy: 0.9000 - val_loss: 1.89
75 - val_accuracy: 0.5714
Epoch 93/100
2/2 [==============================] - 6s 3s/step - loss: 0.1030 - accuracy: 1.0000 - val_loss: 1.31
05 - val_accuracy: 0.5714
Epoch 94/100
2/2 [==============================] - 6s 3s/step - loss: 0.0658 - accuracy: 0.9750 - val_loss: 1.20
68 - val_accuracy: 0.4762
Epoch 95/100
2/2 [==============================] - 6s 3s/step - loss: 0.0748 - accuracy: 1.0000 - val_loss: 1.52
07 - val_accuracy: 0.5238
Epoch 96/100
2/2 [==============================] - 6s 3s/step - loss: 0.0870 - accuracy: 0.9500 - val_loss: 1.41
60 - val_accuracy: 0.5714
Epoch 97/100
2/2 [==============================] - 6s 3s/step - loss: 0.1132 - accuracy: 0.9500 - val_loss: 1.87
65 - val_accuracy: 0.5238
Epoch 98/100
```

```
2/2 [==============================] - 6s 3s/step - loss: 0.3140 - accuracy: 0.8250 - val_loss: 0.91
40 - val_accuracy: 0.5238
Epoch 99/100
2/2 [==============================] - 6s 3s/step - loss: 0.1249 - accuracy: 1.0000 - val_loss: 1.08
61 - val_accuracy: 0.5238
Epoch 100/100
2/2 [==============================] - 6s 3s/step - loss: 0.0609 - accuracy: 1.0000 - val_loss: 1.11
07 - val_accuracy: 0.5238
```

Out[14]:

```
<tensorflow.python.keras.callbacks.History at 0x7fbfc04957d0>
```

Evaluate the Model and obtain Loss and Accuracy

In [15]:

```
test_loss, test_accuracy = model.evaluate(test)
```

```
WARNING:tensorflow:sample_weight modes were coerced from
  ...
    to
  ['...']
1/1 [==============================] - 1s 768ms/step - loss: 1.1107 - accuracy: 0.5238
```

Loss and Accuracy after 100 Epochs

In [21]:

```
print("Loss:", test_loss, "Accuracy:", test_accuracy)
```

```
Loss: 1.1106642484664917 Accuracy: 0.52380955
```

In [22]:

```
model.history.history.keys()
```

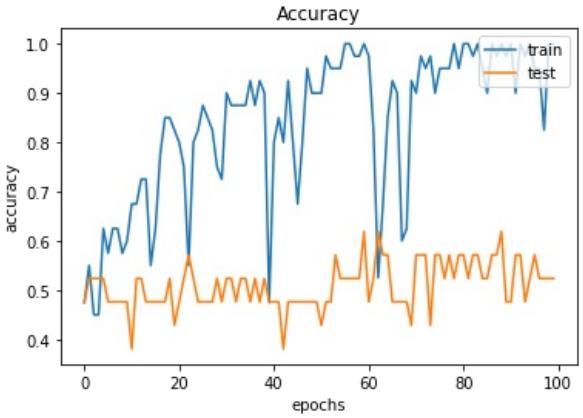
Out[22]:

```
dict_keys(['loss', 'accuracy', 'val_loss', 'val_accuracy'])
```

Plotting the Graph

In [23]:

```
from matplotlib import pyplot as plt
plt.plot(model.history.history['accuracy'])
plt.plot(model.history.history['val_accuracy'])
plt.title('Accuracy')
plt.ylabel('accuracy')
plt.xlabel('epochs')
plt.legend(['train', 'test'], loc="upper right")
plt.show()
```



Executing for another 100 Epochs

In [24]:

```
model.fit(train, validation_data=test, epochs=100)
```

```
WARNING:tensorflow:sample_weight modes were coerced from
  ...
```

```
    to
  ['...']
WARNING:tensorflow:sample_weight modes were coerced from
  ...
    to
  ['...']
Train for 2 steps, validate for 1 steps
Epoch 1/100
2/2 [==============================] - 6s 3s/step - loss: 0.0482 - accuracy: 1.0000 - val_loss: 1.18
28 - val_accuracy: 0.5238
Epoch 2/100
2/2 [==============================] - 6s 3s/step - loss: 0.0455 - accuracy: 1.0000 - val_loss: 1.18
36 - val_accuracy: 0.5238
Epoch 3/100
2/2 [==============================] - 6s 3s/step - loss: 0.0355 - accuracy: 1.0000 - val_loss: 1.22
24 - val_accuracy: 0.5238
Epoch 4/100
2/2 [==============================] - 6s 3s/step - loss: 0.0385 - accuracy: 1.0000 - val_loss: 1.22
21 - val_accuracy: 0.5238
Epoch 5/100
2/2 [==============================] - 6s 3s/step - loss: 0.0351 - accuracy: 1.0000 - val_loss: 1.23
80 - val_accuracy: 0.5238
Epoch 6/100
2/2 [==============================] - 6s 3s/step - loss: 0.0283 - accuracy: 1.0000 - val_loss: 1.26
46 - val_accuracy: 0.5238
Epoch 7/100
2/2 [==============================] - 6s 3s/step - loss: 0.0296 - accuracy: 1.0000 - val_loss: 1.26
97 - val_accuracy: 0.5238
Epoch 8/100
2/2 [==============================] - 6s 3s/step - loss: 0.0277 - accuracy: 1.0000 - val_loss: 1.28
67 - val_accuracy: 0.5238
Epoch 9/100
2/2 [==============================] - 6s 3s/step - loss: 0.0265 - accuracy: 1.0000 - val_loss: 1.30
27 - val_accuracy: 0.5238
Epoch 10/100
2/2 [==============================] - 6s 3s/step - loss: 0.0232 - accuracy: 1.0000 - val_loss: 1.31
28 - val_accuracy: 0.5238
Epoch 11/100
2/2 [==============================] - 6s 3s/step - loss: 0.0228 - accuracy: 1.0000 - val_loss: 1.31
82 - val_accuracy: 0.5238
Epoch 12/100
2/2 [==============================] - 6s 3s/step - loss: 0.0223 - accuracy: 1.0000 - val_loss: 1.33
07 - val_accuracy: 0.5714
Epoch 13/100
2/2 [==============================] - 6s 3s/step - loss: 0.0187 - accuracy: 1.0000 - val_loss: 1.34
24 - val_accuracy: 0.5238
Epoch 14/100
2/2 [==============================] - 6s 3s/step - loss: 0.0220 - accuracy: 1.0000 - val_loss: 1.34
26 - val_accuracy: 0.5238
Epoch 15/100
2/2 [==============================] - 6s 3s/step - loss: 0.0167 - accuracy: 1.0000 - val_loss: 1.39
92 - val_accuracy: 0.6190
Epoch 16/100
2/2 [==============================] - 6s 3s/step - loss: 0.0171 - accuracy: 1.0000 - val_loss: 1.37
14 - val_accuracy: 0.5714
Epoch 17/100
2/2 [==============================] - 6s 3s/step - loss: 0.0172 - accuracy: 1.0000 - val_loss: 1.35
47 - val_accuracy: 0.5238
Epoch 18/100
2/2 [==============================] - 6s 3s/step - loss: 0.0162 - accuracy: 1.0000 - val_loss: 1.36
21 - val_accuracy: 0.5714
Epoch 19/100
2/2 [==============================] - 6s 3s/step - loss: 0.0148 - accuracy: 1.0000 - val_loss: 1.37
99 - val_accuracy: 0.5714
Epoch 20/100
2/2 [==============================] - 6s 3s/step - loss: 0.0130 - accuracy: 1.0000 - val_loss: 1.37
61 - val_accuracy: 0.5714
Epoch 21/100
2/2 [==============================] - 6s 3s/step - loss: 0.0154 - accuracy: 1.0000 - val_loss: 1.38
79 - val_accuracy: 0.5714
Epoch 22/100
2/2 [==============================] - 6s 3s/step - loss: 0.0111 - accuracy: 1.0000 - val_loss: 1.39
74 - val_accuracy: 0.5714
Epoch 23/100
2/2 [==============================] - 6s 3s/step - loss: 0.0134 - accuracy: 1.0000 - val_loss: 1.38
51 - val_accuracy: 0.5714
Epoch 24/100
2/2 [==============================] - 6s 3s/step - loss: 0.0127 - accuracy: 1.0000 - val_loss: 1.41
86 - val_accuracy: 0.5714
Epoch 25/100
2/2 [==============================] - 6s 3s/step - loss: 0.0120 - accuracy: 1.0000 - val_loss: 1.41
63 - val_accuracy: 0.5714
Epoch 26/100
```

```
2/2 [==============================] - 6s 3s/step - loss: 0.0126 - accuracy: 1.0000 - val_loss: 1.42
02 - val_accuracy: 0.5714
Epoch 27/100
2/2 [==============================] - 6s 3s/step - loss: 0.0112 - accuracy: 1.0000 - val_loss: 1.40
53 - val_accuracy: 0.5714
Epoch 28/100
2/2 [==============================] - 6s 3s/step - loss: 0.0140 - accuracy: 1.0000 - val_loss: 1.40
21 - val_accuracy: 0.5714
Epoch 29/100
2/2 [==============================] - 6s 3s/step - loss: 0.0122 - accuracy: 1.0000 - val_loss: 1.44
82 - val_accuracy: 0.6190
Epoch 30/100
2/2 [==============================] - 6s 3s/step - loss: 0.0090 - accuracy: 1.0000 - val_loss: 1.42
31 - val_accuracy: 0.5714
Epoch 31/100
2/2 [==============================] - 6s 3s/step - loss: 0.0091 - accuracy: 1.0000 - val_loss: 1.45
28 - val_accuracy: 0.5714
Epoch 32/100
2/2 [==============================] - 6s 3s/step - loss: 0.0122 - accuracy: 1.0000 - val_loss: 1.43
11 - val_accuracy: 0.5714
Epoch 33/100
2/2 [==============================] - 6s 3s/step - loss: 0.0128 - accuracy: 1.0000 - val_loss: 1.54
69 - val_accuracy: 0.5714
Epoch 34/100
2/2 [==============================] - 6s 3s/step - loss: 0.0114 - accuracy: 1.0000 - val_loss: 1.44
44 - val_accuracy: 0.5714
Epoch 35/100
2/2 [==============================] - 6s 3s/step - loss: 0.0105 - accuracy: 1.0000 - val_loss: 1.51
14 - val_accuracy: 0.6190
Epoch 36/100
2/2 [==============================] - 6s 3s/step - loss: 0.0097 - accuracy: 1.0000 - val_loss: 1.45
48 - val_accuracy: 0.5714
Epoch 37/100
2/2 [==============================] - 6s 3s/step - loss: 0.0112 - accuracy: 1.0000 - val_loss: 1.51
85 - val_accuracy: 0.6190
Epoch 38/100
2/2 [==============================] - 6s 3s/step - loss: 0.0077 - accuracy: 1.0000 - val_loss: 1.48
85 - val_accuracy: 0.5714
Epoch 39/100
2/2 [==============================] - 6s 3s/step - loss: 0.0075 - accuracy: 1.0000 - val_loss: 1.49
12 - val_accuracy: 0.5714
Epoch 40/100
2/2 [==============================] - 6s 3s/step - loss: 0.0058 - accuracy: 1.0000 - val_loss: 1.52
40 - val_accuracy: 0.5714
Epoch 41/100
2/2 [==============================] - 6s 3s/step - loss: 0.0059 - accuracy: 1.0000 - val_loss: 1.55
06 - val_accuracy: 0.6190
Epoch 42/100
2/2 [==============================] - 6s 3s/step - loss: 0.0099 - accuracy: 1.0000 - val_loss: 1.48
89 - val_accuracy: 0.5714
Epoch 43/100
2/2 [==============================] - 6s 3s/step - loss: 0.0086 - accuracy: 1.0000 - val_loss: 1.52
79 - val_accuracy: 0.5714
Epoch 44/100
2/2 [==============================] - 6s 3s/step - loss: 0.0066 - accuracy: 1.0000 - val_loss: 1.51
89 - val_accuracy: 0.5714
Epoch 45/100
2/2 [==============================] - 6s 3s/step - loss: 0.0072 - accuracy: 1.0000 - val_loss: 1.52
37 - val_accuracy: 0.5714
Epoch 46/100
2/2 [==============================] - 6s 3s/step - loss: 0.0080 - accuracy: 1.0000 - val_loss: 1.51
59 - val_accuracy: 0.5714
Epoch 47/100
2/2 [==============================] - 6s 3s/step - loss: 0.0069 - accuracy: 1.0000 - val_loss: 1.52
56 - val_accuracy: 0.5714
Epoch 48/100
2/2 [==============================] - 6s 3s/step - loss: 0.0052 - accuracy: 1.0000 - val_loss: 1.52
84 - val_accuracy: 0.5714
Epoch 49/100
2/2 [==============================] - 6s 3s/step - loss: 0.0066 - accuracy: 1.0000 - val_loss: 1.53
57 - val_accuracy: 0.5714
Epoch 50/100
2/2 [==============================] - 6s 3s/step - loss: 0.0050 - accuracy: 1.0000 - val_loss: 1.53
27 - val_accuracy: 0.5714
Epoch 51/100
2/2 [==============================] - 6s 3s/step - loss: 0.0049 - accuracy: 1.0000 - val_loss: 1.54
27 - val_accuracy: 0.5714
Epoch 52/100
2/2 [==============================] - 6s 3s/step - loss: 0.0058 - accuracy: 1.0000 - val_loss: 1.55
50 - val_accuracy: 0.5714
Epoch 53/100
2/2 [==============================] - 6s 3s/step - loss: 0.0056 - accuracy: 1.0000 - val_loss: 1.55
57 - val_accuracy: 0.5714
```

```
Epoch 54/100
2/2 [==============================] - 6s 3s/step - loss: 0.0066 - accuracy: 1.0000 - val_loss: 1.54
16 - val_accuracy: 0.5714
Epoch 55/100
2/2 [==============================] - 6s 3s/step - loss: 0.0060 - accuracy: 1.0000 - val_loss: 1.57
44 - val_accuracy: 0.5714
Epoch 56/100
2/2 [==============================] - 6s 3s/step - loss: 0.0039 - accuracy: 1.0000 - val_loss: 1.57
01 - val_accuracy: 0.5714
Epoch 57/100
2/2 [==============================] - 6s 3s/step - loss: 0.0047 - accuracy: 1.0000 - val_loss: 1.55
81 - val_accuracy: 0.5714
Epoch 58/100
2/2 [==============================] - 6s 3s/step - loss: 0.0061 - accuracy: 1.0000 - val_loss: 1.56
00 - val_accuracy: 0.5714
Epoch 59/100
2/2 [==============================] - 6s 3s/step - loss: 0.0056 - accuracy: 1.0000 - val_loss: 1.58
14 - val_accuracy: 0.5714
Epoch 60/100
2/2 [==============================] - 6s 3s/step - loss: 0.0039 - accuracy: 1.0000 - val_loss: 1.57
62 - val_accuracy: 0.5714
Epoch 61/100
2/2 [==============================] - 6s 3s/step - loss: 0.0046 - accuracy: 1.0000 - val_loss: 1.59
22 - val_accuracy: 0.5714
Epoch 62/100
2/2 [==============================] - 6s 3s/step - loss: 0.0039 - accuracy: 1.0000 - val_loss: 1.58
17 - val_accuracy: 0.5714
Epoch 63/100
2/2 [==============================] - 6s 3s/step - loss: 0.0051 - accuracy: 1.0000 - val_loss: 1.58
28 - val_accuracy: 0.5714
Epoch 64/100
2/2 [==============================] - 6s 3s/step - loss: 0.0048 - accuracy: 1.0000 - val_loss: 1.60
14 - val_accuracy: 0.5714
Epoch 65/100
2/2 [==============================] - 6s 3s/step - loss: 0.0042 - accuracy: 1.0000 - val_loss: 1.60
60 - val_accuracy: 0.5714
Epoch 66/100
2/2 [==============================] - 6s 3s/step - loss: 0.0051 - accuracy: 1.0000 - val_loss: 1.57
74 - val_accuracy: 0.5714
Epoch 67/100
2/2 [==============================] - 6s 3s/step - loss: 0.0043 - accuracy: 1.0000 - val_loss: 1.61
90 - val_accuracy: 0.5714
Epoch 68/100
2/2 [==============================] - 6s 3s/step - loss: 0.0037 - accuracy: 1.0000 - val_loss: 1.61
61 - val_accuracy: 0.5714
Epoch 69/100
2/2 [==============================] - 6s 3s/step - loss: 0.0054 - accuracy: 1.0000 - val_loss: 1.58
09 - val_accuracy: 0.5714
Epoch 70/100
2/2 [==============================] - 6s 3s/step - loss: 0.0046 - accuracy: 1.0000 - val_loss: 1.61
69 - val_accuracy: 0.5714
Epoch 71/100
2/2 [==============================] - 6s 3s/step - loss: 0.0044 - accuracy: 1.0000 - val_loss: 1.60
90 - val_accuracy: 0.5714
Epoch 72/100
2/2 [==============================] - 6s 3s/step - loss: 0.0045 - accuracy: 1.0000 - val_loss: 1.63
36 - val_accuracy: 0.5714
Epoch 73/100
2/2 [==============================] - 6s 3s/step - loss: 0.0040 - accuracy: 1.0000 - val_loss: 1.60
86 - val_accuracy: 0.5714
Epoch 74/100
2/2 [==============================] - 6s 3s/step - loss: 0.0042 - accuracy: 1.0000 - val_loss: 1.63
88 - val_accuracy: 0.5714
Epoch 75/100
2/2 [==============================] - 7s 3s/step - loss: 0.0031 - accuracy: 1.0000 - val_loss: 1.62
66 - val_accuracy: 0.5714
Epoch 76/100
2/2 [==============================] - 6s 3s/step - loss: 0.0031 - accuracy: 1.0000 - val_loss: 1.64
99 - val_accuracy: 0.5714
Epoch 77/100
2/2 [==============================] - 6s 3s/step - loss: 0.0040 - accuracy: 1.0000 - val_loss: 1.62
03 - val_accuracy: 0.5714
Epoch 78/100
2/2 [==============================] - 6s 3s/step - loss: 0.0034 - accuracy: 1.0000 - val_loss: 1.63
83 - val_accuracy: 0.5714
Epoch 79/100
2/2 [==============================] - 6s 3s/step - loss: 0.0035 - accuracy: 1.0000 - val_loss: 1.62
53 - val_accuracy: 0.5714
Epoch 80/100
2/2 [==============================] - 6s 3s/step - loss: 0.0049 - accuracy: 1.0000 - val_loss: 1.67
89 - val_accuracy: 0.6190
Epoch 81/100
2/2 [==============================] - 6s 3s/step - loss: 0.0033 - accuracy: 1.0000 - val_loss: 1.64
```

```
71 - val_accuracy: 0.5714
Epoch 82/100
2/2 [==============================] - 6s 3s/step - loss: 0.0037 - accuracy: 1.0000 - val_loss: 1.65
17 - val_accuracy: 0.5714
Epoch 83/100
2/2 [==============================] - 6s 3s/step - loss: 0.0041 - accuracy: 1.0000 - val_loss: 1.70
67 - val_accuracy: 0.5714
Epoch 84/100
2/2 [==============================] - 6s 3s/step - loss: 0.0033 - accuracy: 1.0000 - val_loss: 1.67
12 - val_accuracy: 0.5714
Epoch 85/100
2/2 [==============================] - 6s 3s/step - loss: 0.0027 - accuracy: 1.0000 - val_loss: 1.66
07 - val_accuracy: 0.5714
Epoch 86/100
2/2 [==============================] - 6s 3s/step - loss: 0.0039 - accuracy: 1.0000 - val_loss: 1.67
40 - val_accuracy: 0.5714
Epoch 87/100
2/2 [==============================] - 6s 3s/step - loss: 0.0035 - accuracy: 1.0000 - val_loss: 1.68
30 - val_accuracy: 0.5714
Epoch 88/100
2/2 [==============================] - 6s 3s/step - loss: 0.0032 - accuracy: 1.0000 - val_loss: 1.69
10 - val_accuracy: 0.5714
Epoch 89/100
2/2 [==============================] - 6s 3s/step - loss: 0.0035 - accuracy: 1.0000 - val_loss: 1.70
37 - val_accuracy: 0.5714
Epoch 90/100
2/2 [==============================] - 6s 3s/step - loss: 0.0033 - accuracy: 1.0000 - val_loss: 1.72
40 - val_accuracy: 0.5714
Epoch 91/100
2/2 [==============================] - 6s 3s/step - loss: 0.0026 - accuracy: 1.0000 - val_loss: 1.72
41 - val_accuracy: 0.5714
Epoch 92/100
2/2 [==============================] - 6s 3s/step - loss: 0.0050 - accuracy: 1.0000 - val_loss: 1.71
02 - val_accuracy: 0.5714
Epoch 93/100
2/2 [==============================] - 6s 3s/step - loss: 0.0045 - accuracy: 1.0000 - val_loss: 1.73
87 - val_accuracy: 0.5714
Epoch 94/100
2/2 [==============================] - 6s 3s/step - loss: 0.0033 - accuracy: 1.0000 - val_loss: 1.74
81 - val_accuracy: 0.5714
Epoch 95/100
2/2 [==============================] - 6s 3s/step - loss: 0.0021 - accuracy: 1.0000 - val_loss: 1.75
72 - val_accuracy: 0.5714
Epoch 96/100
2/2 [==============================] - 6s 3s/step - loss: 0.0027 - accuracy: 1.0000 - val_loss: 1.75
02 - val_accuracy: 0.5714
Epoch 97/100
2/2 [==============================] - 6s 3s/step - loss: 0.0036 - accuracy: 1.0000 - val_loss: 1.72
33 - val_accuracy: 0.5714
Epoch 98/100
2/2 [==============================] - 6s 3s/step - loss: 0.0024 - accuracy: 1.0000 - val_loss: 1.75
53 - val_accuracy: 0.5714
Epoch 99/100
2/2 [==============================] - 6s 3s/step - loss: 0.0036 - accuracy: 1.0000 - val_loss: 1.79
58 - val_accuracy: 0.5714
Epoch 100/100
2/2 [==============================] - 6s 3s/step - loss: 0.0031 - accuracy: 1.0000 - val_loss: 1.73
43 - val_accuracy: 0.5714
```

Out[24]:

```
<tensorflow.python.keras.callbacks.History at 0x7fbf546cccd0>
```

In [25]:

```
test_loss, test_accuracy = model.evaluate(test)
```

```
WARNING:tensorflow:sample_weight modes were coerced from
  ...
    to
  ['...']
1/1 [==============================] - 1s 777ms/step - loss: 1.7343 - accuracy: 0.5714
```

Loss and Accuracy after 200 Epochs

In [26]:

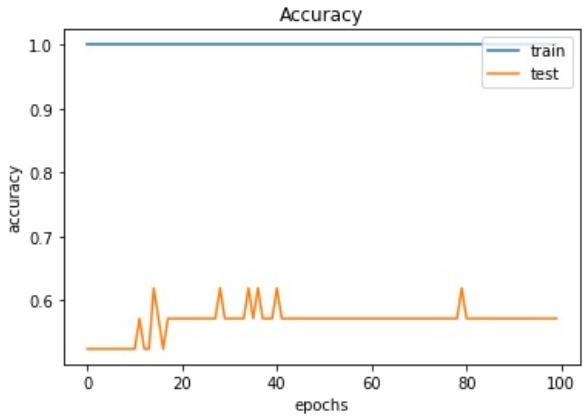
```
print("Loss:", test_loss, "Accuracy:", test_accuracy)
```

```
Loss: 1.7342931032180786 Accuracy: 0.5714286
```

Plotting the Graph

In [30]:

```
from matplotlib import pyplot as plt
plt.plot(model.history.history['accuracy'])
plt.plot(model.history.history['val_accuracy'])
plt.title('Accuracy')
plt.ylabel('accuracy')
plt.xlabel('epochs')
plt.legend(['train', 'test'], loc="upper right")
plt.show()
```



Executing for another 100 Epochs

In [31]:

```
model.fit(train, validation_data=test, epochs=100)
```

```
WARNING:tensorflow:sample_weight modes were coerced from
  ...
    to
  ['...']
WARNING:tensorflow:sample_weight modes were coerced from
  ...
    to
  ['...']
Train for 2 steps, validate for 1 steps
Epoch 1/100
2/2 [==============================] - 6s 3s/step - loss: 0.0021 - accuracy: 1.0000 - val_loss: 1.74
34 - val_accuracy: 0.5714
Epoch 2/100
2/2 [==============================] - 6s 3s/step - loss: 0.0024 - accuracy: 1.0000 - val_loss: 1.74
85 - val_accuracy: 0.5714
Epoch 3/100
2/2 [==============================] - 6s 3s/step - loss: 0.0024 - accuracy: 1.0000 - val_loss: 1.77
35 - val_accuracy: 0.5238
Epoch 4/100
2/2 [==============================] - 6s 3s/step - loss: 0.0026 - accuracy: 1.0000 - val_loss: 1.75
88 - val_accuracy: 0.5714
Epoch 5/100
2/2 [==============================] - 6s 3s/step - loss: 0.0026 - accuracy: 1.0000 - val_loss: 1.76
27 - val_accuracy: 0.5714
Epoch 6/100
2/2 [==============================] - 6s 3s/step - loss: 0.0026 - accuracy: 1.0000 - val_loss: 1.76
08 - val_accuracy: 0.5714
Epoch 7/100
2/2 [==============================] - 6s 3s/step - loss: 0.0023 - accuracy: 1.0000 - val_loss: 1.76
61 - val_accuracy: 0.5714
Epoch 8/100
2/2 [==============================] - 6s 3s/step - loss: 0.0023 - accuracy: 1.0000 - val_loss: 1.75
00 - val_accuracy: 0.5714
Epoch 9/100
2/2 [==============================] - 6s 3s/step - loss: 0.0022 - accuracy: 1.0000 - val_loss: 1.77
37 - val_accuracy: 0.5714
Epoch 10/100
2/2 [==============================] - 6s 3s/step - loss: 0.0036 - accuracy: 1.0000 - val_loss: 1.80
03 - val_accuracy: 0.5238
Epoch 11/100
2/2 [==============================] - 6s 3s/step - loss: 0.0024 - accuracy: 1.0000 - val_loss: 1.77
32 - val_accuracy: 0.5714
Epoch 12/100
2/2 [==============================] - 6s 3s/step - loss: 0.0019 - accuracy: 1.0000 - val_loss: 1.79
91 - val_accuracy: 0.5238
```

```
Epoch 13/100
2/2 [==============================] - 6s 3s/step - loss: 0.0033 - accuracy: 1.0000 - val_loss: 1.75
89 - val_accuracy: 0.5714
Epoch 14/100
2/2 [==============================] - 6s 3s/step - loss: 0.0027 - accuracy: 1.0000 - val_loss: 1.76
42 - val_accuracy: 0.5714
Epoch 15/100
2/2 [==============================] - 6s 3s/step - loss: 0.0016 - accuracy: 1.0000 - val_loss: 1.77
73 - val_accuracy: 0.5714
Epoch 16/100
2/2 [==============================] - 6s 3s/step - loss: 0.0022 - accuracy: 1.0000 - val_loss: 1.78
24 - val_accuracy: 0.5714
Epoch 17/100
2/2 [==============================] - 6s 3s/step - loss: 0.0018 - accuracy: 1.0000 - val_loss: 1.77
39 - val_accuracy: 0.5714
Epoch 18/100
2/2 [==============================] - 6s 3s/step - loss: 0.0032 - accuracy: 1.0000 - val_loss: 1.82
46 - val_accuracy: 0.5238
Epoch 19/100
2/2 [==============================] - 6s 3s/step - loss: 0.0021 - accuracy: 1.0000 - val_loss: 1.78
87 - val_accuracy: 0.5714
Epoch 20/100
2/2 [==============================] - 6s 3s/step - loss: 0.0018 - accuracy: 1.0000 - val_loss: 1.78
54 - val_accuracy: 0.5714
Epoch 21/100
2/2 [==============================] - 6s 3s/step - loss: 0.0019 - accuracy: 1.0000 - val_loss: 1.79
95 - val_accuracy: 0.5238
Epoch 22/100
2/2 [==============================] - 6s 3s/step - loss: 0.0024 - accuracy: 1.0000 - val_loss: 1.79
59 - val_accuracy: 0.5714
Epoch 23/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.79
88 - val_accuracy: 0.5238
Epoch 24/100
2/2 [==============================] - 6s 3s/step - loss: 0.0017 - accuracy: 1.0000 - val_loss: 1.80
80 - val_accuracy: 0.5238
Epoch 25/100
2/2 [==============================] - 6s 3s/step - loss: 0.0020 - accuracy: 1.0000 - val_loss: 1.78
99 - val_accuracy: 0.5714
Epoch 26/100
2/2 [==============================] - 6s 3s/step - loss: 0.0019 - accuracy: 1.0000 - val_loss: 1.78
67 - val_accuracy: 0.5714
Epoch 27/100
2/2 [==============================] - 6s 3s/step - loss: 0.0024 - accuracy: 1.0000 - val_loss: 1.81
26 - val_accuracy: 0.5238
Epoch 28/100
2/2 [==============================] - 6s 3s/step - loss: 0.0019 - accuracy: 1.0000 - val_loss: 1.79
20 - val_accuracy: 0.5714
Epoch 29/100
2/2 [==============================] - 6s 3s/step - loss: 0.0018 - accuracy: 1.0000 - val_loss: 1.81
57 - val_accuracy: 0.5238
Epoch 30/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.82
06 - val_accuracy: 0.5238
Epoch 31/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.83
17 - val_accuracy: 0.5238
Epoch 32/100
2/2 [==============================] - 6s 3s/step - loss: 0.0024 - accuracy: 1.0000 - val_loss: 1.87
66 - val_accuracy: 0.5714
Epoch 33/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.85
37 - val_accuracy: 0.5238
Epoch 34/100
2/2 [==============================] - 6s 3s/step - loss: 0.0018 - accuracy: 1.0000 - val_loss: 1.83
94 - val_accuracy: 0.5238
Epoch 35/100
2/2 [==============================] - 6s 3s/step - loss: 0.0016 - accuracy: 1.0000 - val_loss: 1.85
87 - val_accuracy: 0.5238
Epoch 36/100
2/2 [==============================] - 6s 3s/step - loss: 0.0016 - accuracy: 1.0000 - val_loss: 1.84
89 - val_accuracy: 0.5238
Epoch 37/100
2/2 [==============================] - 6s 3s/step - loss: 0.0018 - accuracy: 1.0000 - val_loss: 1.83
78 - val_accuracy: 0.5714
Epoch 38/100
2/2 [==============================] - 6s 3s/step - loss: 0.0013 - accuracy: 1.0000 - val_loss: 1.85
11 - val_accuracy: 0.5238
Epoch 39/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.86
72 - val_accuracy: 0.5238
Epoch 40/100
2/2 [==============================] - 6s 3s/step - loss: 0.0017 - accuracy: 1.0000 - val_loss: 1.87
```

```
07 - val_accuracy: 0.5238
Epoch 41/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.86
54 - val_accuracy: 0.5238
Epoch 42/100
2/2 [==============================] - 6s 3s/step - loss: 0.0017 - accuracy: 1.0000 - val_loss: 1.86
05 - val_accuracy: 0.5238
Epoch 43/100
2/2 [==============================] - 6s 3s/step - loss: 0.0021 - accuracy: 1.0000 - val_loss: 1.86
39 - val_accuracy: 0.5238
Epoch 44/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.88
13 - val_accuracy: 0.5238
Epoch 45/100
2/2 [==============================] - 6s 3s/step - loss: 0.0026 - accuracy: 1.0000 - val_loss: 1.85
11 - val_accuracy: 0.5714
Epoch 46/100
2/2 [==============================] - 6s 3s/step - loss: 0.0017 - accuracy: 1.0000 - val_loss: 1.85
50 - val_accuracy: 0.5714
Epoch 47/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.85
39 - val_accuracy: 0.5714
Epoch 48/100
2/2 [==============================] - 6s 3s/step - loss: 0.0020 - accuracy: 1.0000 - val_loss: 1.88
16 - val_accuracy: 0.5238
Epoch 49/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.87
71 - val_accuracy: 0.5238
Epoch 50/100
2/2 [==============================] - 6s 3s/step - loss: 0.0020 - accuracy: 1.0000 - val_loss: 1.87
76 - val_accuracy: 0.5238
Epoch 51/100
2/2 [==============================] - 6s 3s/step - loss: 0.0018 - accuracy: 1.0000 - val_loss: 1.87
99 - val_accuracy: 0.5238
Epoch 52/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.89
14 - val_accuracy: 0.5238
Epoch 53/100
2/2 [==============================] - 6s 3s/step - loss: 0.0011 - accuracy: 1.0000 - val_loss: 1.89
57 - val_accuracy: 0.5238
Epoch 54/100
2/2 [==============================] - 6s 3s/step - loss: 0.0016 - accuracy: 1.0000 - val_loss: 1.88
87 - val_accuracy: 0.5238
Epoch 55/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.89
21 - val_accuracy: 0.5238
Epoch 56/100
2/2 [==============================] - 6s 3s/step - loss: 0.0012 - accuracy: 1.0000 - val_loss: 1.88
57 - val_accuracy: 0.5238
Epoch 57/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.89
67 - val_accuracy: 0.5238
Epoch 58/100
2/2 [==============================] - 6s 3s/step - loss: 0.0013 - accuracy: 1.0000 - val_loss: 1.88
99 - val_accuracy: 0.5238
Epoch 59/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.88
92 - val_accuracy: 0.5238
Epoch 60/100
2/2 [==============================] - 6s 3s/step - loss: 0.0013 - accuracy: 1.0000 - val_loss: 1.90
77 - val_accuracy: 0.5238
Epoch 61/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.91
72 - val_accuracy: 0.5238
Epoch 62/100
2/2 [==============================] - 6s 3s/step - loss: 0.0013 - accuracy: 1.0000 - val_loss: 1.92
46 - val_accuracy: 0.5238
Epoch 63/100
2/2 [==============================] - 6s 3s/step - loss: 9.9071e-04 - accuracy: 1.0000 - val_loss:
1.9229 - val_accuracy: 0.5238
Epoch 64/100
2/2 [==============================] - 6s 3s/step - loss: 0.0016 - accuracy: 1.0000 - val_loss: 1.89
70 - val_accuracy: 0.5238
Epoch 65/100
2/2 [==============================] - 6s 3s/step - loss: 0.0017 - accuracy: 1.0000 - val_loss: 1.90
31 - val_accuracy: 0.5238
Epoch 66/100
2/2 [==============================] - 6s 3s/step - loss: 8.5372e-04 - accuracy: 1.0000 - val_loss:
1.9087 - val_accuracy: 0.5238
Epoch 67/100
2/2 [==============================] - 6s 3s/step - loss: 9.8957e-04 - accuracy: 1.0000 - val_loss:
1.9097 - val_accuracy: 0.5238
Epoch 68/100
```

```
2/2 [==============================] - 6s 3s/step - loss: 0.0011 - accuracy: 1.0000 - val_loss: 1.91
60 - val_accuracy: 0.5238
Epoch 69/100
2/2 [==============================] - 6s 3s/step - loss: 9.8626e-04 - accuracy: 1.0000 - val_loss:
1.9194 - val_accuracy: 0.5238
Epoch 70/100
2/2 [==============================] - 6s 3s/step - loss: 0.0012 - accuracy: 1.0000 - val_loss: 1.92
79 - val_accuracy: 0.5238
Epoch 71/100
2/2 [==============================] - 6s 3s/step - loss: 0.0011 - accuracy: 1.0000 - val_loss: 1.92
35 - val_accuracy: 0.5238
Epoch 72/100
2/2 [==============================] - 6s 3s/step - loss: 0.0010 - accuracy: 1.0000 - val_loss: 1.92
31 - val_accuracy: 0.5238
Epoch 73/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.93
41 - val_accuracy: 0.5238
Epoch 74/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.91
76 - val_accuracy: 0.5238
Epoch 75/100
2/2 [==============================] - 6s 3s/step - loss: 0.0013 - accuracy: 1.0000 - val_loss: 1.91
34 - val_accuracy: 0.5238
Epoch 76/100
2/2 [==============================] - 6s 3s/step - loss: 0.0011 - accuracy: 1.0000 - val_loss: 1.90
93 - val_accuracy: 0.5238
Epoch 77/100
2/2 [==============================] - 6s 3s/step - loss: 0.0018 - accuracy: 1.0000 - val_loss: 1.90
63 - val_accuracy: 0.5238
Epoch 78/100
2/2 [==============================] - 6s 3s/step - loss: 0.0012 - accuracy: 1.0000 - val_loss: 1.92
42 - val_accuracy: 0.5238
Epoch 79/100
2/2 [==============================] - 6s 3s/step - loss: 0.0015 - accuracy: 1.0000 - val_loss: 1.93
14 - val_accuracy: 0.5238
Epoch 80/100
2/2 [==============================] - 6s 3s/step - loss: 9.7203e-04 - accuracy: 1.0000 - val_loss:
1.9268 - val_accuracy: 0.5238
Epoch 81/100
2/2 [==============================] - 6s 3s/step - loss: 0.0012 - accuracy: 1.0000 - val_loss: 1.92
31 - val_accuracy: 0.5238
Epoch 82/100
2/2 [==============================] - 6s 3s/step - loss: 0.0012 - accuracy: 1.0000 - val_loss: 1.91
28 - val_accuracy: 0.5714
Epoch 83/100
2/2 [==============================] - 6s 3s/step - loss: 0.0016 - accuracy: 1.0000 - val_loss: 1.90
29 - val_accuracy: 0.5714
Epoch 84/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.92
04 - val_accuracy: 0.5238
Epoch 85/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.94
74 - val_accuracy: 0.5238
Epoch 86/100
2/2 [==============================] - 6s 3s/step - loss: 0.0012 - accuracy: 1.0000 - val_loss: 1.94
36 - val_accuracy: 0.5238
Epoch 87/100
2/2 [==============================] - 6s 3s/step - loss: 0.0010 - accuracy: 1.0000 - val_loss: 1.93
51 - val_accuracy: 0.5238
Epoch 88/100
2/2 [==============================] - 6s 3s/step - loss: 9.2618e-04 - accuracy: 1.0000 - val_loss:
1.9315 - val_accuracy: 0.5238
Epoch 89/100
2/2 [==============================] - 6s 3s/step - loss: 8.0365e-04 - accuracy: 1.0000 - val_loss:
1.9326 - val_accuracy: 0.5238
Epoch 90/100
2/2 [==============================] - 6s 3s/step - loss: 0.0010 - accuracy: 1.0000 - val_loss: 1.94
33 - val_accuracy: 0.5238
Epoch 91/100
2/2 [==============================] - 6s 3s/step - loss: 9.0969e-04 - accuracy: 1.0000 - val_loss:
1.9451 - val_accuracy: 0.5238
Epoch 92/100
2/2 [==============================] - 6s 3s/step - loss: 7.0680e-04 - accuracy: 1.0000 - val_loss:
1.9595 - val_accuracy: 0.5238
Epoch 93/100
2/2 [==============================] - 6s 3s/step - loss: 8.8275e-04 - accuracy: 1.0000 - val_loss:
1.9715 - val_accuracy: 0.5238
Epoch 94/100
2/2 [==============================] - 6s 3s/step - loss: 9.4149e-04 - accuracy: 1.0000 - val_loss:
1.9770 - val_accuracy: 0.5238
Epoch 95/100
2/2 [==============================] - 6s 3s/step - loss: 0.0011 - accuracy: 1.0000 - val_loss: 1.97
13 - val_accuracy: 0.5238
```

```
Epoch 96/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.99
53 - val_accuracy: 0.5238
Epoch 97/100
2/2 [==============================] - 6s 3s/step - loss: 7.4439e-04 - accuracy: 1.0000 - val_loss:
1.9917 - val_accuracy: 0.5238
Epoch 98/100
2/2 [==============================] - 6s 3s/step - loss: 0.0014 - accuracy: 1.0000 - val_loss: 1.97
29 - val_accuracy: 0.5238
Epoch 99/100
2/2 [==============================] - 6s 3s/step - loss: 0.0011 - accuracy: 1.0000 - val_loss: 1.99
76 - val_accuracy: 0.5238
Epoch 100/100
2/2 [==============================] - 6s 3s/step - loss: 7.1657e-04 - accuracy: 1.0000 - val_loss:
1.9932 - val_accuracy: 0.5238
```

Out[31]:

```
<tensorflow.python.keras.callbacks.History at 0x7fbf54758110>
```

In [32]:

```
test_loss, test_accuracy = model.evaluate(test)
```

```
WARNING:tensorflow:sample_weight modes were coerced from
  ...
    to
  ['...']
1/1 [==============================] - 1s 729ms/step - loss: 1.9932 - accuracy: 0.5238
```

Loss and Accuracy after 300 Epochs

In [33]:

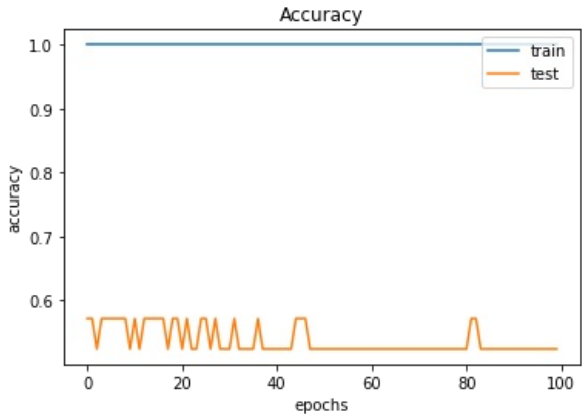
```
print("Loss:", test_loss, "Accuracy:", test_accuracy)
```

```
Loss: 1.9932399988174438 Accuracy: 0.52380955
```

Plotting the Graph

In [34]:

```
from matplotlib import pyplot as plt
plt.plot(model.history.history['accuracy'])
plt.plot(model.history.history['val_accuracy'])
plt.title('Accuracy')
plt.ylabel('accuracy')
plt.xlabel('epochs')
plt.legend(['train', 'test'], loc="upper right")
plt.show()
```



In [ ]: