In [1]:
```
'Importing all the necessary libraries'
```

Out[1]:
```
'Importing all the necessary libraries'
```

In [2]:
```
import pandas as pd
import numpy as np
from sklearn.metrics import classification_report
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import classification_report
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import confusion_matrix
from sklearn.metrics import confusion_matrix, ConfusionMatrixDisplay
from sklearn.neighbors import KNeighborsClassifier
from sklearn.linear_model import LogisticRegression
from sklearn import svm
from sklearn.metrics import accuracy_score
```

In [3]:
```
'Reading the data file'
```

Out[3]:
```
'Reading the data file'
```

In [4]:
```
df=pd.read_csv('voice.csv')
```

In [5]:
```
df.head()
```

Out[5]:

	meanfreq	sd	median	Q25	Q75	IQR	skew	kurt	sp.ent	sfm	...	centroid	meanfun	minfun	maxfun	me
0	0.059781	0.064241	0.032027	0.015071	0.090193	0.075122	12.863462	274.402906	0.893369	0.491918	...	0.059781	0.084279	0.015702	0.275862	0
1	0.066009	0.067310	0.040229	0.019414	0.092666	0.073252	22.423285	634.613855	0.892193	0.513724	...	0.066009	0.107937	0.015826	0.250000	0
2	0.077316	0.083829	0.036718	0.008701	0.131908	0.123207	30.757155	1024.927705	0.846389	0.478905	...	0.077316	0.098706	0.015656	0.271186	0
3	0.151228	0.072111	0.158011	0.096582	0.207955	0.111374	1.232831	4.177296	0.963322	0.727232	...	0.151228	0.088965	0.017798	0.250000	0

	meanfreq	sd	median	Q25	Q75	IQR	skew	kurt	sp.ent	sfm	...	centroid	meanfun	minfun	maxfun	me
4	0.135120	0.079146	0.124656	0.078720	0.206045	0.127325	1.101174	4.333713	0.971955	0.783568	...	0.135120	0.106398	0.016931	0.266667	0

5 rows × 21 columns

In [6]:
```
'Removing all the blank cells and their respective rows'
```

Out[6]:
```
'Removing all the blank cells and their respective rows'
```

In [7]:
```
df.dropna(inplace=True)
```

In [8]:
```
y=df['label']
X=df[['meanfreq','sd','median','Q25','Q75','IQR','skew','kurt','sp.ent','sfm','mode','centroid','meanfun','minfun','maxfun','meand

y=y.to_numpy()
Y_lst=list(y)

no_of_males=Y_lst.count("male")
no_of_females=Y_lst.count('female')
```

In [9]:
```
X
```

Out[9]:

	meanfreq	sd	median	Q25	Q75	IQR	skew	kurt	sp.ent	sfm	mode	centroid	meanfun	minfun	ma
0	0.059781	0.064241	0.032027	0.015071	0.090193	0.075122	12.863462	274.402906	0.893369	0.491918	0.000000	0.059781	0.084279	0.015702	0.2
1	0.066009	0.067310	0.040229	0.019414	0.092666	0.073252	22.423285	634.613855	0.892193	0.513724	0.000000	0.066009	0.107937	0.015826	0.2
2	0.077316	0.083829	0.036718	0.008701	0.131908	0.123207	30.757155	1024.927705	0.846389	0.478905	0.000000	0.077316	0.098706	0.015656	0.2
3	0.151228	0.072111	0.158011	0.096582	0.207955	0.111374	1.232831	4.177296	0.963322	0.727232	0.083878	0.151228	0.088965	0.017798	0.2
4	0.135120	0.079146	0.124656	0.078720	0.206045	0.127325	1.101174	4.333713	0.971955	0.783568	0.104261	0.135120	0.106398	0.016931	0.2
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

	meanfreq	sd	median	Q25	Q75	IQR	skew	kurt	sp.ent	sfm	mode	centroid	meanfun	minfun	ma
3163	0.131884	0.084734	0.153707	0.049285	0.201144	0.151859	1.762129	6.630383	0.962934	0.763182	0.200836	0.131884	0.182790	0.083770	0.2(
3164	0.116221	0.089221	0.076758	0.042718	0.204911	0.162193	0.693730	2.503954	0.960716	0.709570	0.013683	0.116221	0.188980	0.034409	0.2'
3165	0.142056	0.095798	0.183731	0.033424	0.224360	0.190936	1.876502	6.604509	0.946854	0.654196	0.008006	0.142056	0.209918	0.039506	0.2'
3166	0.143659	0.090628	0.184976	0.043508	0.219943	0.176435	1.591065	5.388298	0.950436	0.675470	0.212202	0.143659	0.172375	0.034483	0.2!
3167	0.165509	0.092884	0.183044	0.070072	0.250827	0.180756	1.705029	5.769115	0.938829	0.601529	0.267702	0.165509	0.185607	0.062257	0.2'

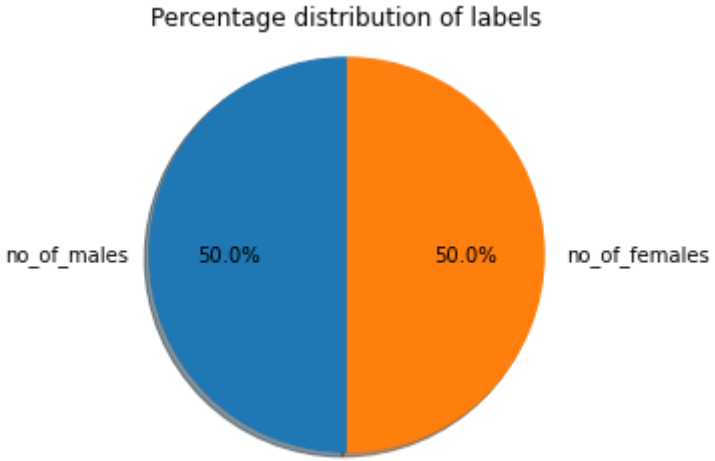
3168 rows × 20 columns

In [10]:
```
y
```

Out[10]:
```
array(['male', 'male', 'male', ..., 'female', 'female', 'female'],
      dtype=object)
```

In [11]:
```
print('------------------2)Depict percentage distribution of label on a pie chart--------------------------------')
data = [no_of_males,no_of_females]
label = ['no_of_males','no_of_females']
plt.pie(data, labels=label, autopct='%1.1f%%', shadow=True, startangle=90)
plt.title('Percentage distribution of labels')
plt.axis('equal')
plt.show()
```

```
------------------2)Depict percentage distribution of label on a pie chart--------------------------------
```



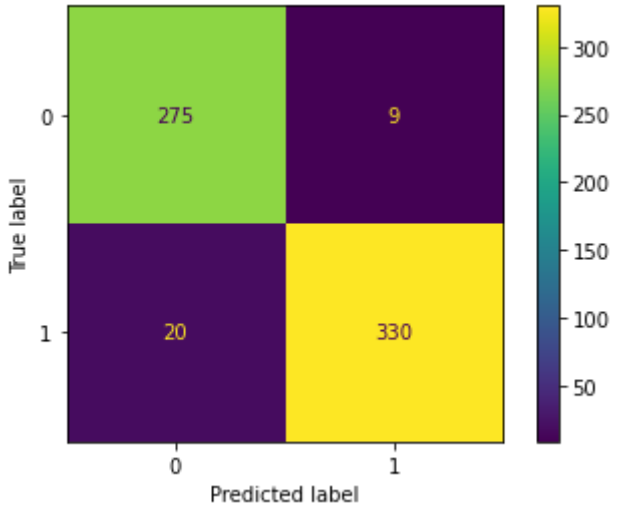
In [12]:
```
'3)Considering all the features as independent feature and label as dependent feature,split the dataset training and testing data
```

Out[12]:
```
'3)Considering all the features as independent feature and label as dependent feature,split the dataset training and testing data
with test size=20%'
```

In [13]:
```
X=X.to_numpy()
x_train, x_test, y_train, y_test = train_test_split(X, y ,test_size = 0.2)
```

In [14]:
```
print('-----------------------------------Decision_Tree_Classifier-----------------------------------------')
decision_tree = DecisionTreeClassifier()
decision_tree = decision_tree.fit(x_train,y_train)
y_pred_DecisionTreeClassifier=decision_tree.predict(x_test)
cm = confusion_matrix(y_test,y_pred_DecisionTreeClassifier)
disp = ConfusionMatrixDisplay(confusion_matrix=cm)
disp.plot()
plt.show()
print(classification_report(y_test,y_pred_DecisionTreeClassifier, target_names=['male','female']))
```

```
-----------------------------------Decision_Tree_Classifier-----------------------------------------
```



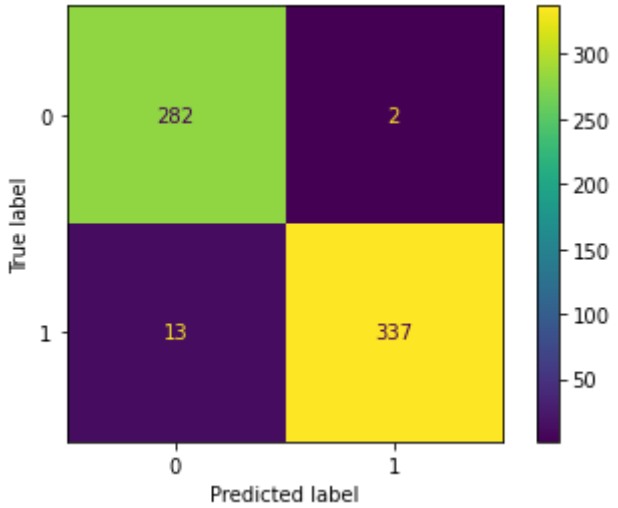
	precision	recall	f1-score	support
male	0.93	0.97	0.95	284
female	0.97	0.94	0.96	350
accuracy			0.95	634
macro avg	0.95	0.96	0.95	634
weighted avg	0.95	0.95	0.95	634

In [15]:

```
print('---------------------------------------Random_Forest_Classifier-------------------------------------------')
clf_random_forest = RandomForestClassifier()
clf_random_forest.fit(x_train, y_train)
y_pred_randomforest=clf_random_forest.predict(x_test)
cm_random_forest = confusion_matrix(y_test,y_pred_randomforest)
disp = ConfusionMatrixDisplay(confusion_matrix=cm_random_forest)
disp.plot()

plt.show()
print(classification_report(y_test,y_pred_randomforest, target_names=['male','female']))
```

```
---------------------------------------Random_Forest_Classifier-------------------------------------------
```



	precision	recall	f1-score	support
male	0.96	0.99	0.97	284
female	0.99	0.96	0.98	350
accuracy			0.98	634
macro avg	0.98	0.98	0.98	634
weighted avg	0.98	0.98	0.98	634

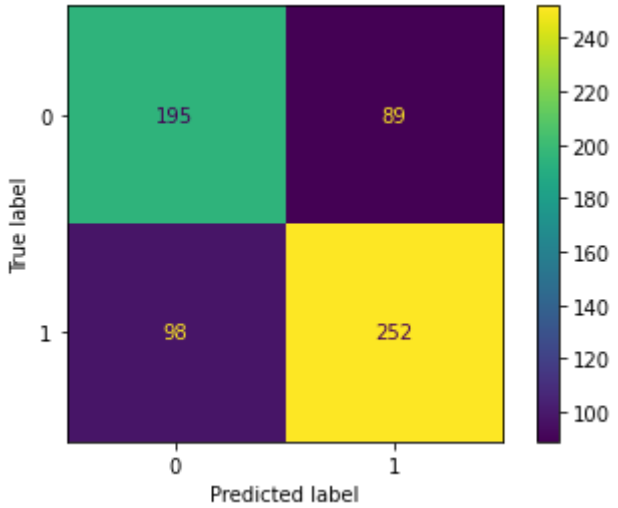
In [16]:

```
print('-------------------------------------KNN-Classifier-------------------------------------------------------')
neigh = KNeighborsClassifier()
neigh.fit(x_train, y_train)

y_pred_KNN=neigh.predict(x_test)
cm_KNN = confusion_matrix(y_test,y_pred_KNN)
disp = ConfusionMatrixDisplay(confusion_matrix=cm_KNN)
disp.plot()

plt.show()
print(classification_report(y_test,y_pred_KNN, target_names=['male','female']))
```

```
-------------------------------------KNN-Classifier-------------------------------------------------------
```



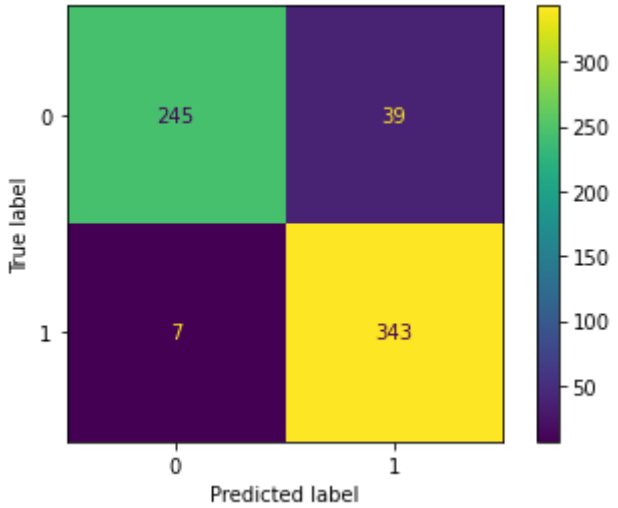
	precision	recall	f1-score	support
male	0.67	0.69	0.68	284
female	0.74	0.72	0.73	350
accuracy			0.71	634
macro avg	0.70	0.70	0.70	634
weighted avg	0.71	0.71	0.71	634

In [17]:

```
print('-----------------------------------------------Logistic-Regression-----------------------------------------------')
clf_logistic_regression = LogisticRegression( max_iter=1000)
clf_logistic_regression.fit(x_train, y_train)
y_pred_logistic_regression=clf_logistic_regression.predict(x_test)
cm_logistic_regression = confusion_matrix(y_test,y_pred_logistic_regression)
disp = ConfusionMatrixDisplay(confusion_matrix=cm_logistic_regression )
disp.plot()

plt.show()
print(classification_report(y_test,y_pred_logistic_regression, target_names=['male','female']))
```

```
-----------------------------------------------Logistic-Regression-----------------------------------------------
```



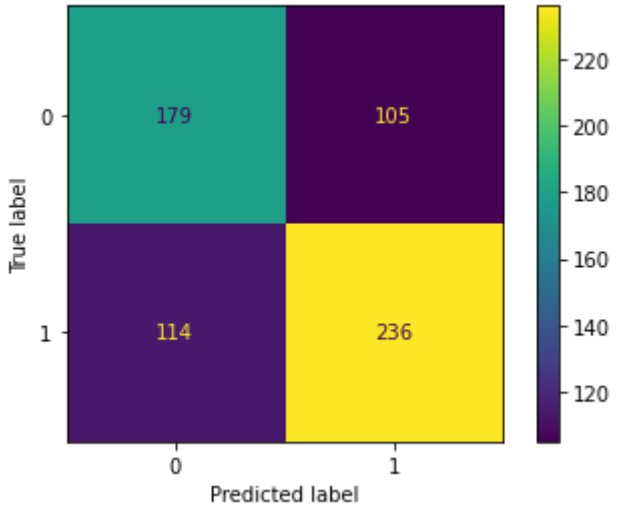
	precision	recall	f1-score	support
male	0.97	0.86	0.91	284
female	0.90	0.98	0.94	350
accuracy			0.93	634
macro avg	0.94	0.92	0.93	634
weighted avg	0.93	0.93	0.93	634

In [18]:

```
print('-------------------------------------------------SVM-Classifier-------------------------------------------------')
clf_svm = svm.SVC()
clf_svm.fit(x_train, y_train)
y_pred_svm=clf_svm .predict(x_test)
cm_svm = confusion_matrix(y_test,y_pred_svm)
disp = ConfusionMatrixDisplay(confusion_matrix=cm_svm )
disp.plot()

plt.show()
print(classification_report(y_test,y_pred_svm, target_names=['male','female']))
```

```
-------------------------------------------------SVM-Classifier-------------------------------------------------
```



	precision	recall	f1-score	support
male	0.61	0.63	0.62	284
female	0.69	0.67	0.68	350
accuracy			0.65	634
macro avg	0.65	0.65	0.65	634
weighted avg	0.66	0.65	0.66	634

In [19]:

```
print('Accuracy of DecisionTreeClassifier : ',accuracy_score(y_test, y_pred_DecisionTreeClassifier))
print('Accuracy of RandomForestClassifier : ',accuracy_score(y_test, y_pred_randomforest))
print('Accuracy of KNeighborsClassifier : ',accuracy_score(y_test, y_pred_KNN))
print('Accuracy of LogisticRegression : ',accuracy_score(y_test,y_pred_logistic_regression))
print('Accuracy of SVM-Classifier : ',accuracy_score(y_test,y_pred_svm))
```

```
Accuracy of DecisionTreeClassifier :  0.9542586750788643
Accuracy of RandomForestClassifier :  0.9763406940063092
Accuracy of KNeighborsClassifier :  0.7050473186119873
Accuracy of LogisticRegression :  0.9274447949526814
Accuracy of SVM-Classifier :  0.6545741324921136
```

In [20]:

```
dit={accuracy_score(y_test, y_pred_DecisionTreeClassifier):'DecisionTreeClassifier',accuracy_score(y_test, y_pred_randomforest):'R

print(f'The model with best accuracy is {dit[max(dit.keys())]} which has the accuracy of {max(dit.keys())}')
```

```
The model with best accuracy is RandomForestClassifier which has the accuracy of 0.9763406940063092
```

In [ ]: