```python
import numpy as np
from keras.datasets import imdb
from keras.preprocessing.sequence import pad_sequences
from keras.models import Sequential
from keras.layers import Embedding, Bidirectional, LSTM, Dense

# Load the IMDB dataset (only the top 10,000 words)
(x_train, y_train), (x_test, y_test) = imdb.load_data(num_words=10000)

# Pad or truncate the sequences to a fixed length of 250
max_len = 250
x_train = pad_sequences(x_train, maxlen=max_len)
x_test = pad_sequences(x_test, maxlen=max_len)

# Define the deep neural network architecture
model = Sequential()
model.add(Embedding(input_dim=10000, output_dim=128, input_length=max_len))
model.add(Bidirectional(LSTM(64, return_sequences=True)))
model.add(Bidirectional(LSTM(32)))
model.add(Dense(1, activation='sigmoid'))

# Compile the model
model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])

# Train the model
history = model.fit(x_train, y_train, epochs=10, batch_size=128, validation_split=0.2)

# Evaluate the model on the test set
loss, acc = model.evaluate(x_test, y_test, batch_size=128)
print(f'Test accuracy: {acc:.4f}, Test loss: {loss:.4f}')
```