Gas Turbine Thermal Design

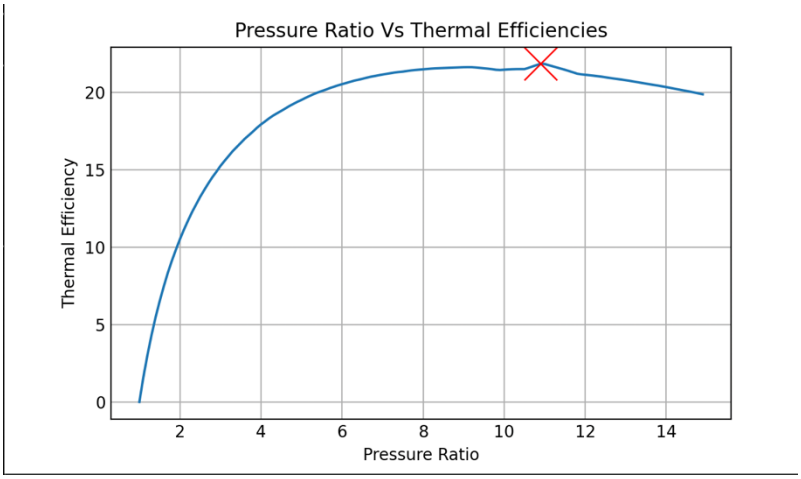
a.) You will use the given code to draw the **thermal efficiency VS Presssure ratio curve** with the engine design parameter below

- Turbine inlet temperature **TIT = 900 C**
- Turbine and Compressor isentropic efficiency of **80%**
- **Ambient air of 15, 20, 25, 30, 35, and 40 C** (you will have total 6 graphs for each ambient air condition)

b.) Find the optimum pressure ratio (best thermal efiiciency at each ambient air condition)

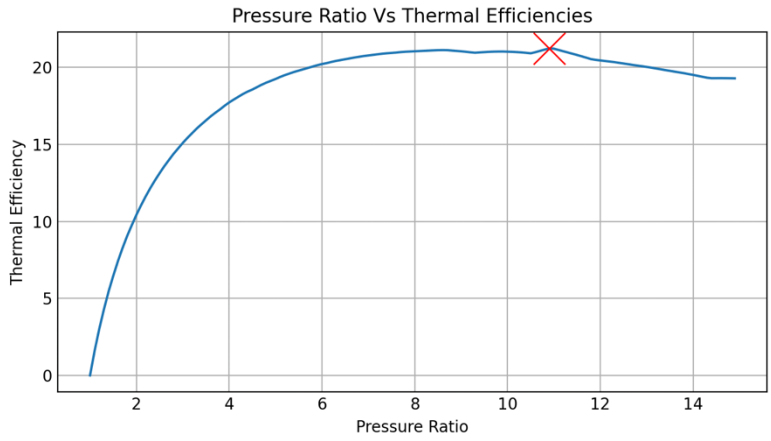
c.) Write the conclusion and the reason to describe result

Ambient air temperature = $15°C$ *or* $288.15\ K$



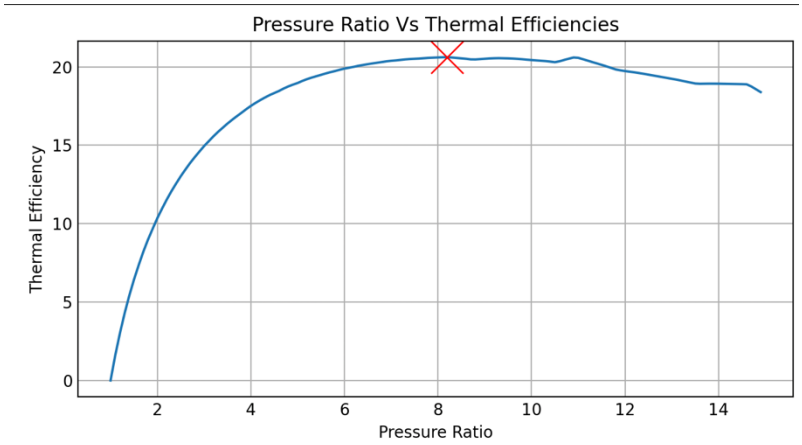

```
Enter the ambient air temperature: 288.15
Enter the compression ratio (Enter a range in this form "start,stop" with no space in between): 1,15
Enter the compressor effiency: 0.8
Enter the turbine effiency: 0.8
Enter turbine inlet temperature: 1173.15
Pressure ratio at maximum efficiency:  10.90000000000001
Maximum thermal efficiency:  21.83868885818679
```

Ambient air temperature = $20°C$ *or* $293.15\ K$



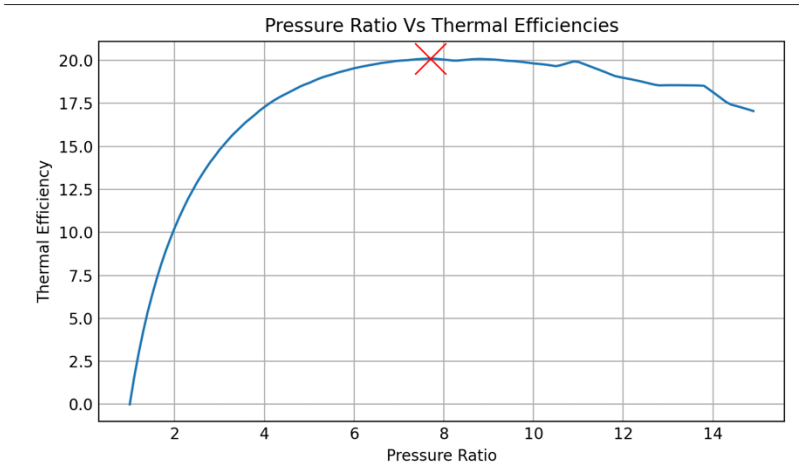

```
Enter the ambient air temperature: 293.15
Enter the compression ratio (Enter a range in this form "start,stop" with no space in between): 1,15
Enter the compressor effiency: 0.8
Enter the turbine effiency: 0.8
Enter turbine inlet temperature: 1173.15
Pressure ratio at maximum efficiency:  10.90000000000001
Maximum thermal efficiency:  21.226685839877636
```

Ambient air temperature = $25°C$ *or* $298.15\ K$



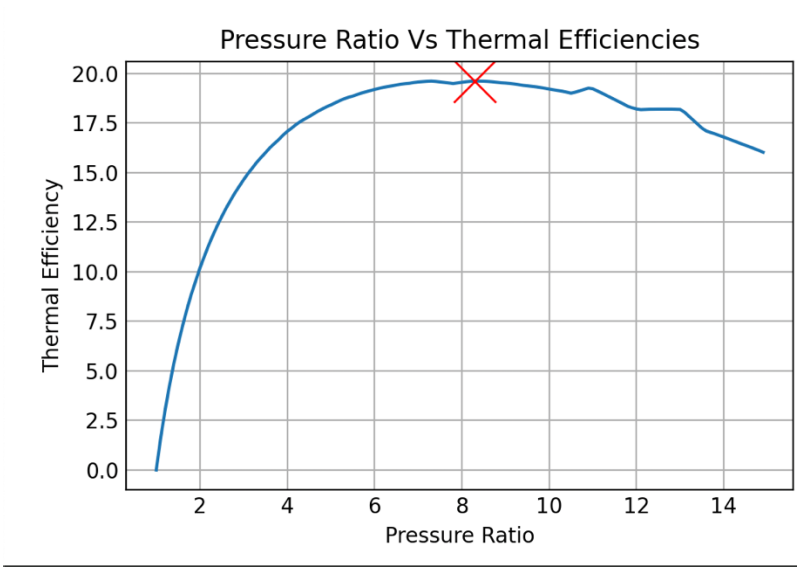

```
Enter the ambient air temperature: 298.15
Enter the compression ratio (Enter a range in this form "start,stop" with no space in between): 1,15
Enter the compressor effiency: 0.8
Enter the turbine effiency: 0.8
Enter turbine inlet temperature: 1173.15
Pressure ratio at maximum efficiency:  8.200000000000006
Maximum thermal efficiency:  20.612400822900018
```

Ambient air temperature = $30°C$ *or* $303.15\ K$



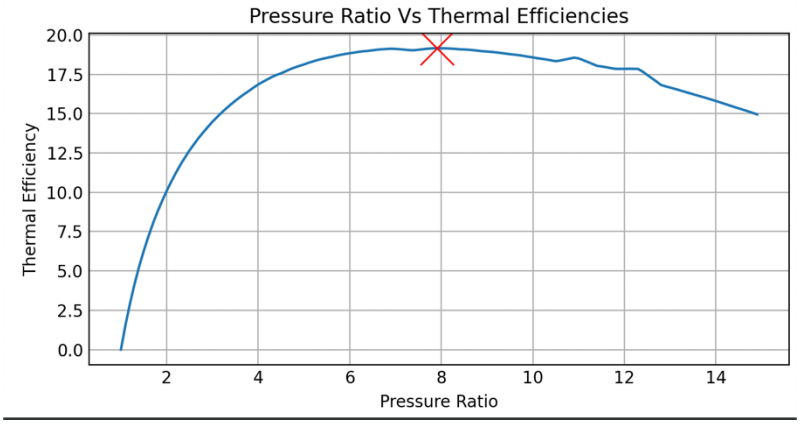

```
Enter the ambient air temperature: 303.15
Enter the compression ratio (Enter a range in this form "start,stop" with no space in between): 1,15
Enter the compressor effiency: 0.8
Enter the turbine effiency: 0.8
Enter turbine inlet temperature: 1173.15
Pressure ratio at maximum efficiency:  7.700000000000006
Maximum thermal efficiency:  20.111411267201643
```

Ambient air temperature = $35°C$ *or* $308.15\ K$




```
Enter the ambient air temperature: 308.15
Enter the compression ratio (Enter a range in this form "start,stop" with no space in between): 1,15
Enter the compressor effiency: 0.8
Enter the turbine effiency: 0.8
Enter turbine inlet temperature: 1173.15
Pressure ratio at maximum efficiency:  8.300000000000006
Maximum thermal efficiency:  19.623353031117066
```

Ambient air temperature = $40°C$ *or* $313.15\ K$




```
Enter the ambient air temperature: 313.15
Enter the compression ratio (Enter a range in this form "start,stop" with no space in between): 1,15
Enter the compressor effiency: 0.8
Enter the turbine effiency: 0.8
Enter turbine inlet temperature: 1173.15
Pressure ratio at maximum efficiency:  7.900000000000006
Maximum thermal efficiency:  19.157508457996048
```

Conclusion

From the results, it is found that thermal efficiencies of the turbine decrease with increasing ambient air temperature. The compression ratio for best efficiencies is found mostly around between 7.9 and 11.

Ye Min Thant (65011605)