

機械工程實驗(二)期末考術科測驗_答案卷

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考試日期：2024.05.20 (19:30 - 21:30)

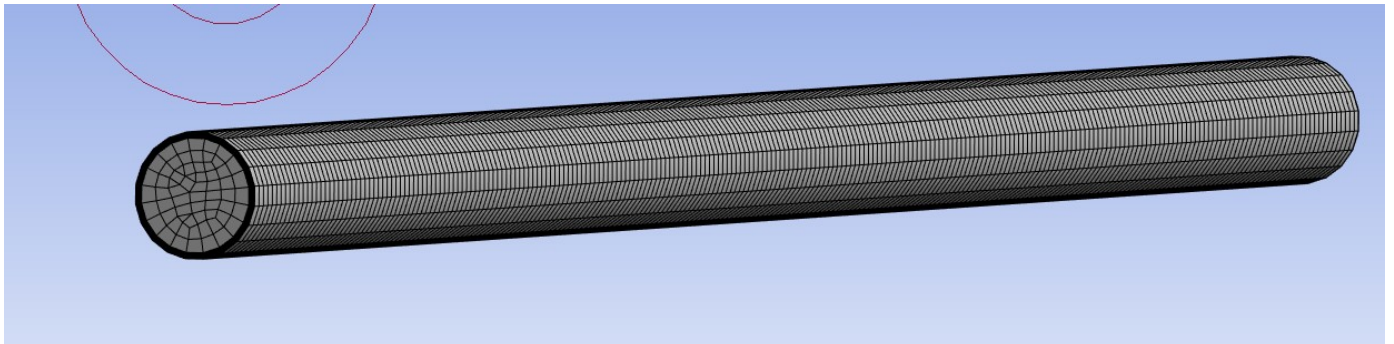
總分：100 分

學號： 姓名：

90

1. 請附上" velocity inlet"的網格分佈及" Detail of Inflation"截圖 (10%)

Details of "Inflation" - Inflation	
Scope	
Scoping Method	Geometry Selection
Geometry	1 Face
Definition	
Suppressed	No
Boundary Scoping Method	Geometry Selection
Boundary	1 Edge
Inflation Option	First Layer Thickness
<input type="checkbox"/> First Layer Height	1.5e-002 mm
<input type="checkbox"/> Maximum Layers	20
<input type="checkbox"/> Growth Rate	1.05
Inflation Algorithm	Pre



2. 請附上 Detail of Mesh 中，" Statistics"截圖 (10%)

Details of "Mesh"	
Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	CFD
Solver Preference	Fluent
Element Order	Linear
<input type="checkbox"/> Element Size	Default (12.52 mm)
Export Format	Standard
Export Preview Surface Mesh	No
Sizing	
Quality	
Inflation	
Advanced	
Statistics	
<input type="checkbox"/> Nodes	118472
<input type="checkbox"/> Elements	115750
Show Detailed Statistics	No

3. 請附上” Velocity Inlet” & “outlet”的 momentum & Thermal 邊界條件設定截圖 (10%)

Velocity Inlet

Zone Name
velocity_inlet

MomentumThermalRadiationSpeciesDPMMultiphasePotentialStructureUDS

Velocity Specification Method
Magnitude, Normal to Boundary

Reference Frame
Absolute

Velocity Magnitude [m/s]
1

Supersonic/Initial Gauge Pressure [Pa]
0

Turbulence

Specification Method
Intensity and Hydraulic Diameter

Turbulent Intensity [%]
5

Hydraulic Diameter [m]
0.01

ApplyCloseHelp

Velocity Inlet

Zone Name
velocity_inlet

MomentumThermalRadiationSpeciesDPMMultiphasePotentialStructureUDS

Temperature [K]
361.15

Pressure Outlet

Zone Name
pressure_outlet

MomentumThermalRadiationSpeciesDPMMultiphasePotentialStructureUDS

Backflow Reference Frame
Absolute

Gauge Pressure [Pa]
0

Pressure Profile Multiplier
1

Backflow Direction Specification Method
Normal to Boundary

Backflow Pressure Specification
Total Pressure

☐ Prevent Reverse Flow

☐ Radial Equilibrium Pressure Distribution

☐ Average Pressure Specification

☐ Target Mass Flow Rate

Turbulence

Specification Method
Intensity and Hydraulic Diameter

Backflow Turbulent Intensity [%]
5

Backflow Hydraulic Diameter [m]
0.01

ApplyCloseHelp

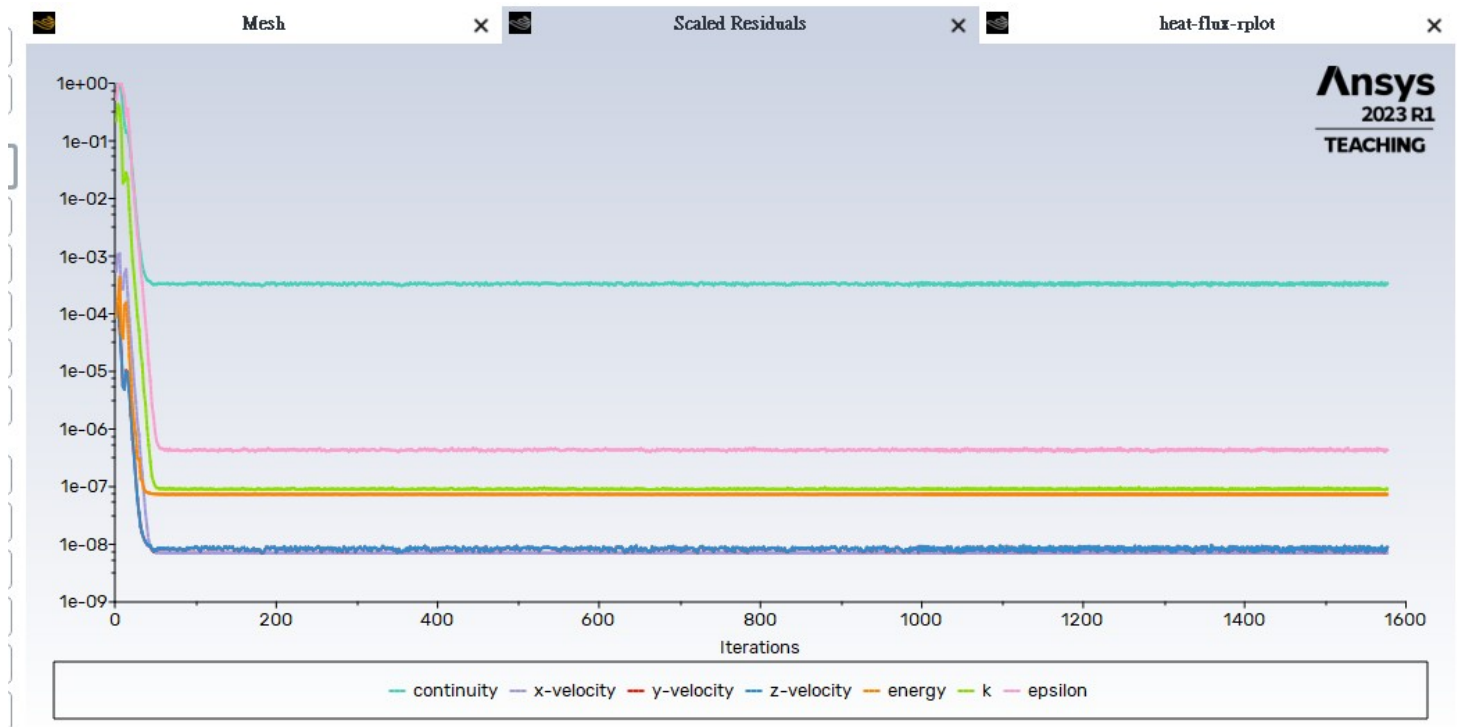
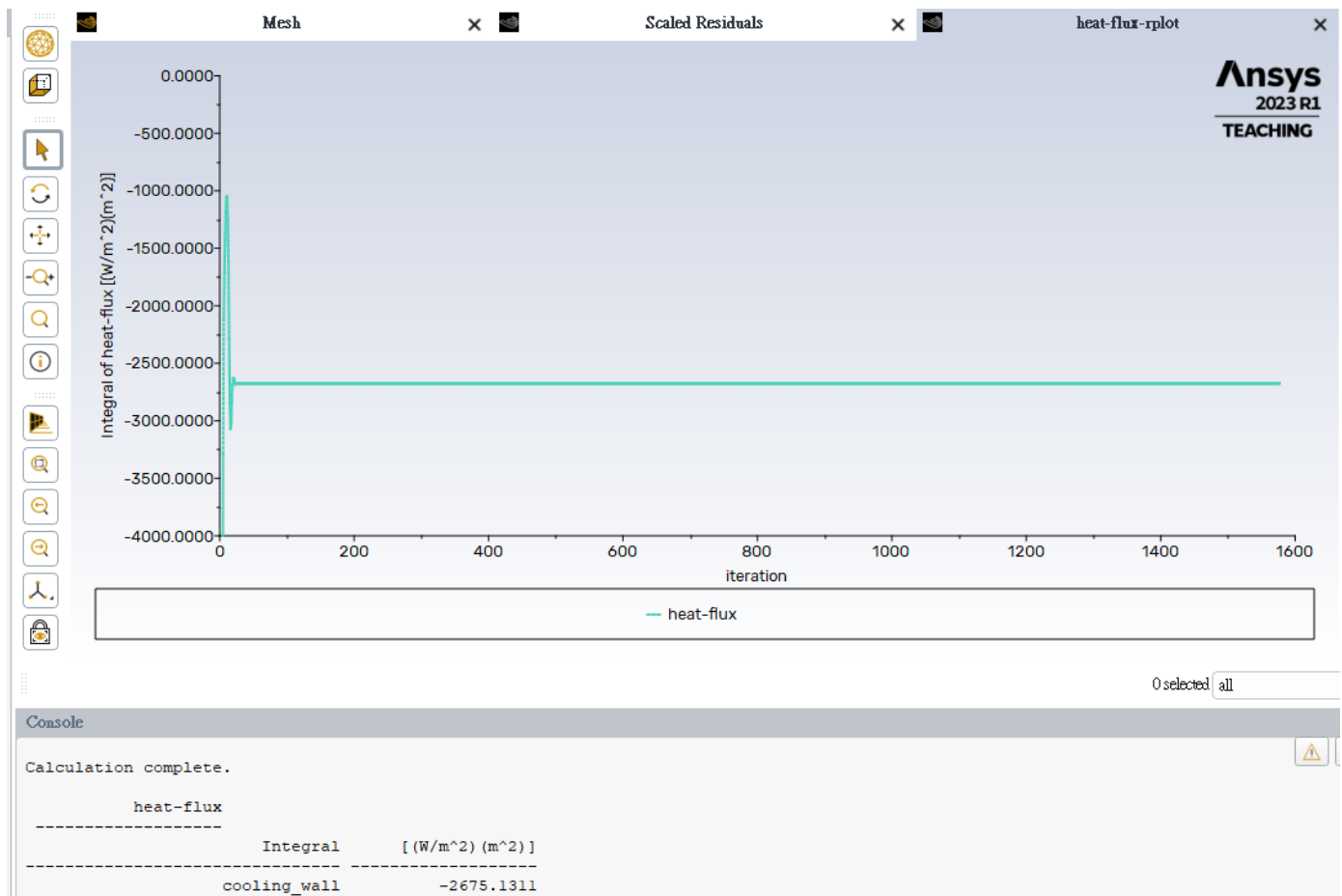
Pressure Outlet

Zone Name
pressure_outlet

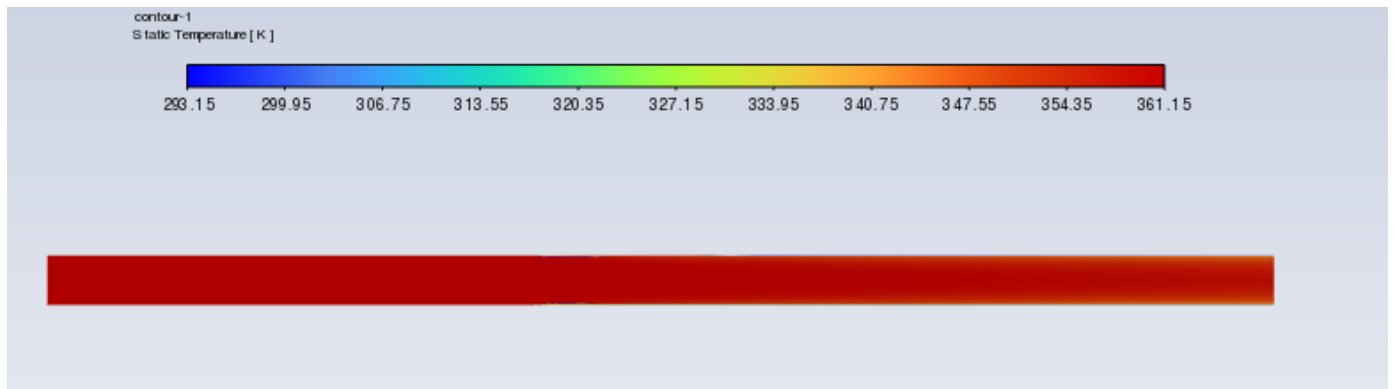
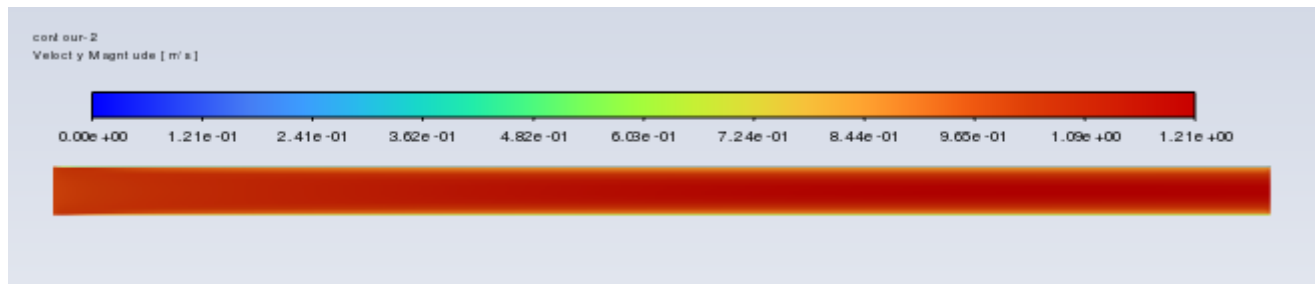
MomentumThermalRadiationSpeciesDPMMultiphasePotentialStructureUDS

Backflow Total Temperature [K]
300

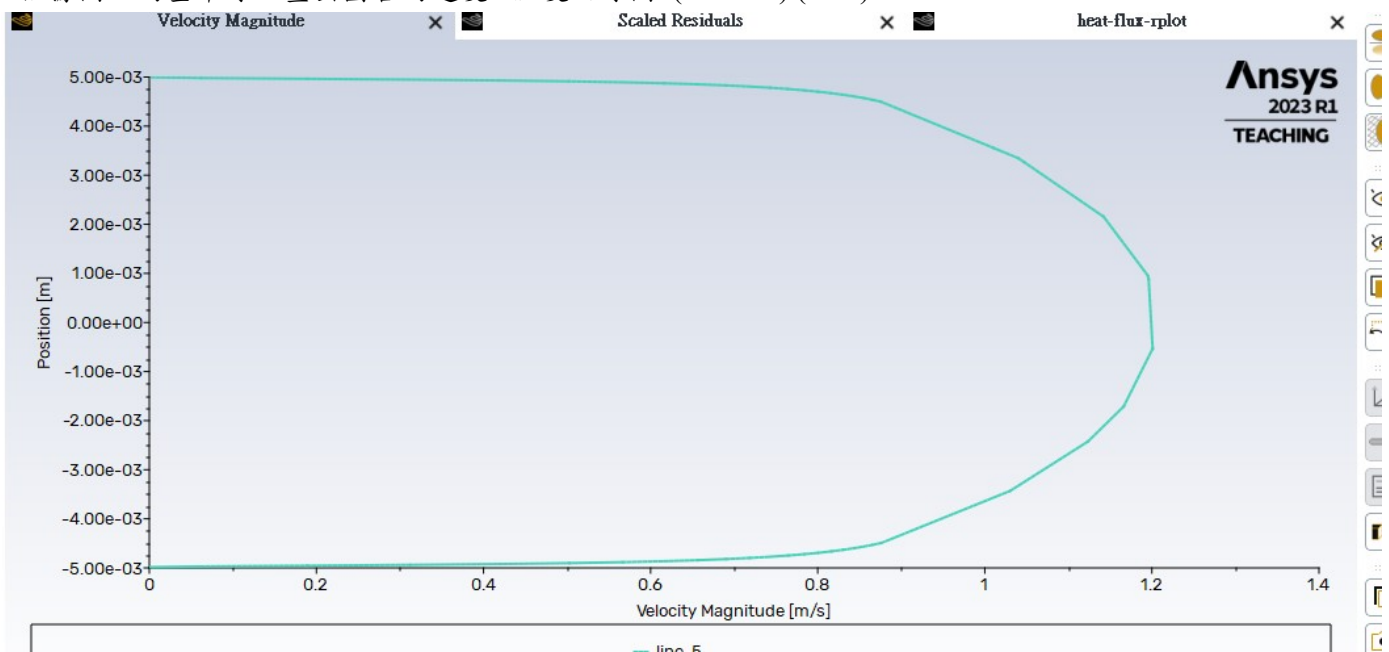
4. 請附上” Residuals”和計算 cooling wall heat flux 數值截圖 (10%)

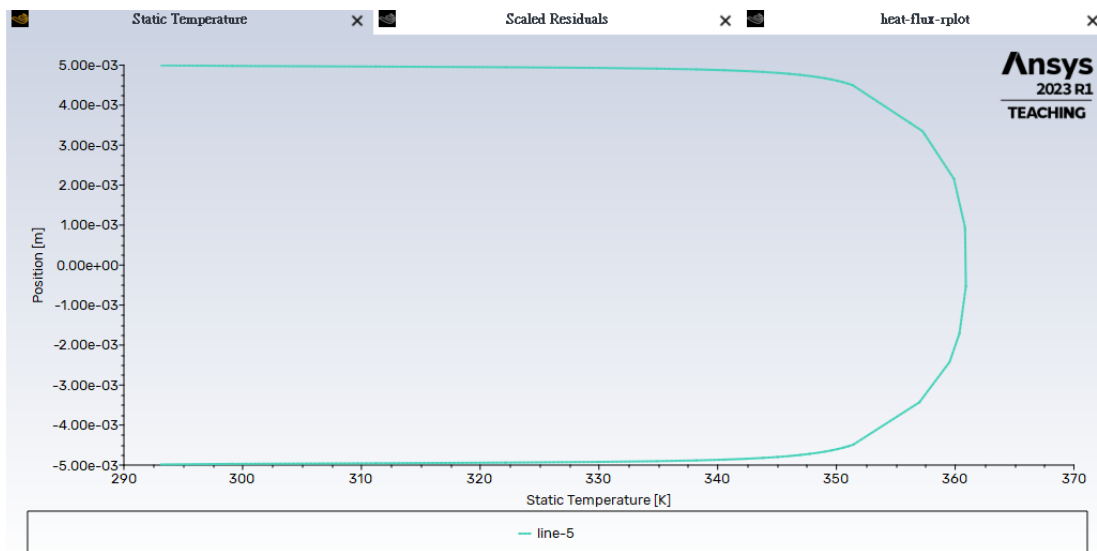


5. 依據圖二的平面條件，畫出圓管剖面的速度&溫度分布圖 (Contour) (10%)



6. 依據圖三的基準線，畫出圓管的速度&溫度曲線圖 (XY Plot) (10%)





7. 請說明邊界層厚度的定義 (10%)

速度邊界層厚度= $u/u_{\text{free_stream}}=0.99$ 處

8. 請說明在模擬圓管時，在主要分析區域前，預設外加一段圓管與流場發展的關係? (10%)

在主要分析區域前，預設外加一段圓管越長，則能確保到主要分析區域時，不受 tube inlet 的初始擾動影響，

9. 請說明網格獨立性測試之必要性? (20%)

測試網格大小的取用大小，和最終計算結果的關係，以確保計算結果的獨立性(計算結果不受網格大小影響)

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