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**Nom et prénom: 4 étudiants maximum par sous groupe…………………………………………………………………………………………………………………………………………………………………………………………**

Envoyer le TP à l’email de l’enseignant suivant :

Email enseignant chargé de module: moumtezbensouici1977@gmail.com

**Etude du cycle OTTO par le logiciel EES**

1. **Objectif du TP**

Le but de ce TP est l’étude thermodynamique du cycle d’OTTO à travers l’étude de l’effet de la variation du rapport de compression volumétrique « r » sur les performances du moteur essence. Le logiciel EES (Engineering Equation Solver) est utilisé pour cette étude.



**Figure 1**. Le cycle OTTO idéal

**Données du problème**

T1=27°C, P1=1 bar, Qin=1800kJ/kg, Taux de compression: r= V1/V2, Taux d’injection, a=V3/V2, γ=1.4, Cv=0.718 kJ/kg.K, Cp=1.005 kJ/kg.K et R=0.287 kJ/kg.K.

1. **Travail demandé**

**Q.1 Ecrire le programme du cycle OTTO (installer le logiciel EES et copier le programme dans le logiciel EES et exécuter le)**

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**Q.2 Remplir les tableaux**

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| r | P1  (bar) | P2  (bar) | P3  (bar) | P4  (bar) | V1  (m3/kg) | V2  (m3/kg) | V3  (m3/kg) | V4  (m3/kg) |
| 4 |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |

**Tableau 1**. Points du cycle P-V

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| --- | --- | --- | --- | --- |
| r | T1  (K) | T 2  (K) | T 3  (K) | T 4  (K) |
| 4 |  |  |  |  |
| 6 |  |  |  |  |
| 8 |  |  |  |  |
| 10 |  |  |  |  |
| 12 |  |  |  |  |

**Tableau 2**. Points du cycle T-S

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| r | T3  (K) | V 2  ( m3/kg ) | Qin  (kJ/kg) | Qout  (kJ/kg) | Wnet  (kJ/kg) | ηth |
| 4 |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |

**Tableau 3**. Performances du cycle OTTO

Avec: r : rapport de compression volumétrique et T1, T2, T3, T4, P1, P2, P3, P4, V1, V2, V3, V4 sont les points du cycle.

**Q.3 Tracer la variation du rendement du cycle «**ηth **» en fonction de « r »**

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**Q.4 Tracer la variation du travail net du cycle** « Wnet » **en fonction de « r »**

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**Q.5 Tracer la variation l’énergie thermique perdue** « Qout » **en fonction de « r »**

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**Q.6 Interpréter les résultats**

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**Q.7 Conclusion générale**

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