**20ME304**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular / Supplementary) DEGREE EXAMINATION** | | | |
| **February, 2023** | **Mechanical Engineering** | | |
| **Third Semester** | **Engineering Thermodynamics** | | |
| **Time:** Three Hours | | **Maximum:7**0 Marks | |
| *Answer Question No.1 compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer ONE question from each unit.* | | | (4X14=56 Marks) |
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| 1. | a) | | | What is a thermodynamic equilibrium state? | CO1 | L1 |  |
|  | b) | | | What is a isolated system? | CO1 | L2 |  |
|  | c) | | | State zeroth law of thermodynamics. | CO1 | L1 |  |
|  | d) | | | State Kelvin-Plank statement. | CO2 | L3 |  |
|  | e) | | | Draw the p-V diagram for isothermal heat addition process. | CO2 | L3 |  |
|  | f) | | | Draw the p-V diagram for Carnot’s cycle. | CO2 | L1 |  |
|  | g) | | | List out the causes of irreversibility in thermodynamic processes. | CO3 | L2 |  |
|  | h) | | | What is the PMM of first kind | CO3 | L1 |  |
|  | i) | | | State principle of increase of entropy. | CO3 | L1 |  |
|  | j) | | | Write the mathematical expression for Clausius inequality. | CO3 | L2 |  |
|  | k) | | | What is the Principle of increase of entropy? | CO4 | L1 |  |
|  | l) | | | Draw the P-V and T-S diagrams for Diesel cycle. | CO4 | L3 |  |
|  | m) | | | Define compression ratio in IC engines. | CO4 | L1 |  |
|  | n) | | | Define compression ration and swept volume of a cylinder in IC engines. | CO4 | L1 |  |
|  | | **Unit - I** | | | | | |
| 2. | a) | | Differentiate between point function and path functions. | | CO1 | L3 | 7M |
|  | b) | | Explain different types of Thermodynamics systems with a neat sketch. | | CO1 | L4 | 7M |
|  | | **(OR)** | | | | | |
| 3. | a) | | Differentiate between reversible and irreversible processes. | | CO1 | L4 | 7M |
|  | b) | | The properties of a closed system change following the relation between pressure and volume as pV = 3.0 where p is in bar V is in m3. Calculate the work done when the pressure increases from 1.5 bar to 7.5 bar. | | CO1 | L3 | 7M |
|  | | **Unit - II** | | | | | |
| 4. | a) | | Derive the expression of SFEE. | | CO2 | L2 | 7M |
|  | b) | | Explain any two applications of SFEE. | | CO2 | L3 | 7M |
|  | | **(OR)** | | | | | |
| 5. | a) | | Explain what are Heat engine and Refrigerator and their performance parameters. | | CO2 | L2 | 7M |
|  | b) | | Two Carnot engines work in series between the sources and sink temperatures of 550 K and 350 K. If both engines develop equal power determine the intermediate temperature. | | CO2 | L3 | 7M |
|  | | **Unit - III** | | | | | |
| 6. | a) | | Derive the expression for Clausius inequality. | | CO3 | L3 | 7M |
|  | b) | | Explain the principle of increase of Entropy. | | CO3 | L4 | 7M |
|  | | **(OR)** | | | | | |
| 7. | a) | | Derive the expression of entropy change for heating a gas at Constant pressure process. | | CO3 | L3 | 7M |
|  | b) | | A system at 500 K receives 7200 kJ/min from a source at 1000 K. The temperature of atmosphere is 300 K. Assuming that the temperatures of system and source remain constant during heat transfer find out: (i) The entropy produced during heat transfer; (ii) The decrease in available energy after heat transfer. | | CO3 | L4 | 7M |
|  | | **Unit - IV** | | | | | |
| 8. | a) | | Derive the expression of thermal efficiency for Otto cycle. | | CO4 | L3 | 7M |
|  | b) | | An engine with 200 mm cylinder diameter and 300 mm stroke works on theoretical Diesel cycle. The initial pressure and temperature of air used are 1 bar and 27°C. The cut-off is 8% of the stroke. Determine: (i) Pressures and temperatures at all salient points. (ii) Theoretical air standard efficiency. | | CO4 | L2 | 7M |
|  | | **(OR)** | | | | | |
| 9. | a) | | Explain the working 4-stroke petrol engine with the help of neat sketch. | | CO4 | L2 | 7M |
|  | b) | | Differentiate between SI and CI engines. | | CO4 | L3 | 7M |

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