

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech III Year I Semester Supplementary Examinations June-2024**

**THERMAL ENGINEERING**

(Mechanical Engineering)

**Time: 3 Hours**

**Max. Marks: 60**

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- |   |   |     |    |    |
|---|---|-----|----|----|
| 1 | a Explain the working principle of single stage single acting reciprocating air compressor. | CO1 | L2 | 6M |
|   | b Mention single stage compressor equation for work, if neglecting clearance volume.        | CO1 | L2 | 6M |

**OR**

- |   |  |     |    |     |
|---|--|-----|----|-----|
| 2 | In a two stage air compressor the pressure are atmospheric 1.0 bar: intercooling 7.4 bar: delivery 42.6 bar. Assuming complete intercooling to the original temperature of 15°C and compression index $n = 1$ , find the work done in compressing 1 kg of air. | CO1 | L3 | 12M |
|---|--|-----|----|-----|

**UNIT-II**

- |   |  |     |    |     |
|---|--|-----|----|-----|
| 3 | A gas turbine unit receives air at 100 kPa and 300 K and compresses it adiabatically to 620 kPa with efficiency of the compressor 88%. The fuel has a heating value of 44180KJ/Kg and the Fuel/air ratio is 0.017 kg fuel /kg air. The turbine internal efficiency is 90%. Calculate the Compressor work , turbine work and thermal efficiency. Take $C_p = 1.005\text{KJ/Kg K}$ . | CO2 | L3 | 12M |
|---|--|-----|----|-----|

**OR**

- |   |  |     |    |     |
|---|--|-----|----|-----|
| 4 | The air enters the compressor of an open cycle constant pressure gas turbine at a pressure of 1 bar and temperature of 20° C. The pressure of the air after compression is 4 bar. The isentropic efficiencies of compressor and turbine are 80% and 85% respectively. The air-fuel ratio used is 90:1. If flow rate of air is 3 kg/s. find,(i) Power developed,(ii) Thermal efficiency of the cycle. | CO2 | L3 | 12M |
|---|--|-----|----|-----|

**UNIT-III**

- |   |   |     |    |     |
|---|---|-----|----|-----|
| 5 | Define Steam nozzle and also explain about expansion of steam in nozzle with neat sketch. | CO3 | L1 | 12M |
|---|---|-----|----|-----|

**OR**

- |   |  |     |    |     |
|---|--|-----|----|-----|
| 6 | What are the effects of super saturation on discharge and heat drop? | CO3 | L1 | 12M |
|---|--|-----|----|-----|

**UNIT-IV**

- |   |   |     |    |    |
|---|---|-----|----|----|
| 7 | a Explain the working process of reaction turbine.        | CO4 | L3 | 6M |
|   | b Show the velocity triangle diagram of reaction turbine. | CO4 | L3 | 6M |

**OR**

- |   |   |     |    |     |
|---|---|-----|----|-----|
| 8 | Explain about the various methods of Governing steam turbines with neat sketches. | CO4 | L2 | 12M |
|---|---|-----|----|-----|

**UNIT-V**

- |   |   |     |    |    |
|---|---|-----|----|----|
| 9 | a What are the important basic components of an IC engines?                 | CO5 | L2 | 6M |
|   | b With a neat sketch explain any three parts in Internal Combustion engine. | CO5 | L3 | 4M |

**OR**

- |    |  |     |    |     |
|----|--|-----|----|-----|
| 10 | A single cylinder, four stroke cycle oil engine is fitted with a rope brake. The diameter of the brake wheel is 600 mm and the rope diameter is 26 mm. The dead load on the brake is 200 N and the spring balance reads 30 N. If the engine runs at 450 rpm, Discover the brake power of the engine? | CO5 | L2 | 12M |
|----|--|-----|----|-----|

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