**18ME402**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **July, 2021** | **Mechanical Engineering** | | |
| **Fourth Semester** | **Applied Thermodynamics** | | |
| **Time:** Three Hours | | **Maximum: 5**0 Marks | |
| *Answer Question No. 1 Compulsorily.* | | | (10X1 = 10 Marks) |
| *Answer* ***ANY ONE*** *question from each Unit.* | | | (4X10=40 Marks) |

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| 1. | a) | State the purpose of fusible- plug in steam boiler. | CO1 | |  |
|  | b) | State S.F.E.E. for an adiabatic nozzle expansion process. | CO2 | |  |
|  | c) | List two advantages of direct mixing condensers. | CO2 | |  |
|  | d) | Mention the effect of air leakage in to condenser. | CO2 | |  |
|  | e) | Define blade efficiency of steam turbine. | CO3 | |  |
|  | f) | Discuss the need of intercooling in multi stage compression. | CO4 | |  |
|  | g) | Mention any two differences between reciprocating and rotary compressors. | CO4 | |  |
|  | h) | Name the refrigerant used in domestic refrigerators. | CO5 | |  |
|  | i) | Define relative humidity of moist air. | CO6 | |  |
|  | j) | Differentiate between partial pressure and saturation pressure. | CO6 | |  |
| **Unit - I** | | | | | |
| 2. | a) | Describe the working principle of Babcock & Wilcox boiler with the aid of a neat line sketch. | CO1 | **6M** | |
|  | b) | Differentiate between boiler mountings and accessories. | CO1 | **4M** | |
|  |  | **(OR)** |  |  | |
| 3. | a) | Derive the expressions for maximum velocity and discharge through a convergent-divergent nozzle in terms of initial pressure, specific volume and polytropic index. | CO2 | **4M** | |
|  | b) | A convergent divergent nozzle is required to pass 1.8 kg of steam per second. At inlet the steam pressure and actual temperature are 7 bar and 200°C respectively and the speed is 75 m/s. Expansion is stable throughout to the exit pressure of 1.1bar. There is no loss by friction in the converging section of the section, but loss by friction between throat and outlet is equivalent to 71 kJ/kg of steam. Calculate (a) the required area of throat in mm2(b) the required area of outlet in mm2. | CO2 | **6M** | |
| **Unit – II** | | | | | |
| 4. | a) | With a neat sketch explain evaporative surface condenser. | CO2 | **4M** | |
|  | b) | Distinguish between jet condensers and surface condensers. | CO2 | **6M** | |
|  |  | **(OR)** |  |  | |
| 5. | a) | What do you mean by compounding of steam turbines? Discuss various methods of compounding steam turbines? | CO3 | **5M** | |
|  | b) | In a reaction turbine, both the fixed and moving blades have same tip angles of 30° and 22° for inlet and outlet respectively. The mean blade speed is 90 m/s and steam consumption is 8 kg/s. Determine the power developed if isentropic heat drop in a pair is 23.5 kJ/kg. | CO3 | **5M** | |
| **Unit - III** | | | | | |
| 6. | a) | Derive an expression for volumetric efficiency of a single stage reciprocating compressor. | CO4 | **5M** | |
|  | b) | Explain the working principle of centrifugal compressor with the aid of a neat line sketch. | CO4 | **5M** | |
|  |  | **(OR)** |  |  | |
| 7. | a) | Explain the working principle of axial flow compressor with neat sketch | CO4 | **5M** | |
|  | b) | Describe the working principle of Vane compressor with neat line sketch. | CO4 | **5M** | |
| **P.T.O.**  **18ME402**  **Unit – IV** | | | | | |
| 8. | a) | Explain the vapor compression refrigeration system with the help of p-h chart. | CO5 | **5M** | |
|  | b) | Discuss the influence of various operational parameters on performance of a vapour compression refrigeration system. | CO5 | **5M** | |
|  |  | **(OR)** |  |  | |
| 9. | a) | Describe the air conditioning system used in summer. | CO6 | **4M** | |
|  | b) | Define the following:  i) Dew point temperature  ii) Relative humidity  iii) Specific humidity | CO6 | **6M** | |

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**NOTE: Psychrometric chart should be provided to the student.**