Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17AE2008** | **Duration :** | **3hrs** |
| **Sub. Name :** | **AERO THERMAL ENGINEERING** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | In an engine working on dual cycle, the temperature and pressure at the beginning of the cycle are 100°C and 1 bar. The compression ratio is 10. The maximum pressure is limited to 70 bar. The total heat applied per kg of air is 1680 kJ/kg. Find the a) Pressure and temperature at all salient points b) air standard efficiency c) Mean effective pressure. Consider all the processes to be ideal. | CO1 | 20 |
| **(OR)** | | | | |
| 2. | a. | Determine the air standard efficiency of a diesel cycle if the compression ratio is 14 and the heat is supplied up to 5% of the stroke. Also determine the mean effective pressure. Assume ideal conditions. | CO1 | 10 |
| b. | Consider an air standard Brayton cycle in which the air enters the compressor at 1 bar and 20°C. The pressure of air leaving the compressor is 3.5 bar and the temperature at the turbine inlet is 600°C. Determine per kg of air, the following: a) efficiency of the cycle b) heat supplied to air c) work available at the shaft. | CO1 | 10 |
|  |  |  |  |  |
| 3. |  | Explain the working of a 4-stroke Petrol engine with neat sketch. Also draw the theoretical and actual p-V diagram of the 4-stroke Petrol engine. | CO2 | 20 |
| **(OR)** | | | | |
| 4. |  | The following observations were recorded during a test on a single cylinder oil engine. Bore 300 mm, Stroke 450 mm, speed 300 rpm, Indicated mean effective pressure 6 bar, net brake load 1.5 kN, brake drum diameter 1.8 m, brake rope diameter 2 cm. Calculate a) Indicated power b) Brake power c) Mechanical efficiency. | CO3 | 20 |
|  |  |  |  |  |
| 5. |  | A single stage reciprocating air compressor is required to compress air at the rate of 1 kg/s from 1 bar and 295 K to 8 bar. Find the work done by the compressor, if the compression is a) isothermal b) isentropic and c) polytrophic with index as 1.25. | CO4 | 20 |
| **(OR)** | | | | |
| 6. |  | Determine the size of the cylinder of a double acting air compressor of 32 kW in which air is drawn in at 1 bar and compressed to 16 bar according to the law pV1.25 = C. Consider speed 300 rpm, Piston speed 180 m/min and volumetric efficiency 80%. | CO4 | 20 |
|  |  |  |  |  |
| 7. |  | Describe the working of a Water-Ammonia vapour absorption refrigeration system with a neat sketch. | CO5 | 20 |
| **(OR)** | | | | |
| 8. |  | A F-12 vapour compression refrigeration system has a condensing temperature of 50°C and evaporator temperature of 0°C. The refrigerating capacity is 7 Tons. The liquid leaving the condenser is saturated liquid and the compression is isentropic. Determine a) refrigerant flow rate b) power required to run the compressor c) heat rejected in the condenser d) COP of the system. Take enthalpy at the end of compression as 210 kJ/kg. The properties of F-12 are as below :   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Temp (°C)** | **Pressure (Bar)** | **hf(kJ/kg)** | **hg (kJ/kg)** | **sf (kJ/kgK)** | **sg (kJ/kgK)** | | 50 | 12.199 | 84.868 | 206.298 | 0.3034 | 0.6792 | | 0 | 3.086 | 36.022 | 187.397 | 0.1418 | 0.6960 | | CO5 | 20 |
|  | | **Compulsory**: |  |  |
| 9. |  | An air conditioned plant is to be designed for the following conditions :  Outdoor conditions = 9°C DBT and 8°C WBT  Required indoor conditions = 21°C DBT and 59% RH  Amount of free air circulation = 0.5 m3/min/person  Seating capacity of the office = 100  The required condition is achieved first by heating and then by adiabatic humidifying. Find the heating capacity of the coil and the surface temperature required if the by-pass factor of the coil is 0.32 and also the capacity of the humidifier. | CO6 | 20 |