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



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

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| **Code :** | **14ME2016** | **Duration :** | **3hrs** |
| **Sub. Name :** | **THERMAL ENGINEERING II** | **Max. Marks :** | **100** |

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

**Use of gas table and psychrometric chart is permitted**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Describe the fuel system for petrol engine with a neat sketch. | CO1 | 10 |
| b. | A four-cylinder, four-stroke oil engine 10 cm in diameter and 15 cm in stroke develops a torque of 185 Nm at 2000 rpm. The oil consumption is 15 lit/hr. The specific gravity of the oil is 0.82 and calorific value of oil is 42,000 kJ/kg. If the indicated mean effective pressure taken from the indicated diagram is 6.7 bar find,   1. Mechanical efficiency, and 2. Brake thermal efficiency. | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | The following observations were recorded during a test on a single cylinder, four stroke diesel engine:  Cylinder diameter = 10 cm  Piston stroke = 15 cm  Engine speed = 480 rpm  Indicated mean effective pressure = 755 kPa  Brake wheel diameter = 62.5 cm  Net load on the brake wheel = 170 N  Calculate   1. Indicated power, 2. Brake power, and 3. Mechanical efficiency of the engine. | CO1 | 10 |
| b. | Discuss water cooling system of an internal comustion engine with a neat sketch. | CO1 | 10 |
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| 3. | a. | Derive an expression for the air standard efficiency of a Diesel cycle. Plot the cycle on PV and TS diagram. | CO1 | 15 |
| b. | Compare Diesel cycle with Otto cycle. | CO1 | 5 |
| **(OR)** | | | | |
| 4. | a. | A gas turbine works on an air standard Brayton cycle. The initial condition of the air is 298 K and 1 bar. The maximum pressure and temperature are limited to 3 bar and 923 K. Determine the following  i) Cycle efficiency,  ii) Heat supplied and heat rejected per kg of air,  iii) Work output per kg of air,  iv) Exhaust temperature. | CO1 | 15 |
| b. | An engine working on Diesel cycle has a bore of 15 cm and stroke of 25 cm. The clearance volume is 400 cm3 and the injection takes place for a duration of 5% of the stroke. Find the air standard efficiency. | CO1 | 5 |
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| 5. | a. | Describe summer air conditioning system with a neat sketch. | CO4 | 10 |
| b. | Describe winter air conditioning system with a neat sketch. | CO4 | 10 |
| **(OR)** | | | | |
| 6. |  | An air-conditioned plant is to be designed for the following conditions.  Outdoor conditions : 9°C DBT and 8°C WBT  Desired Indoor conditions : 21°C DB T & 59% RH  Quantity of air supply : 0.5 m3 / min / person  Seating capacity : 100  The desired condition is achieved first by heating and then by adiabatic humidifying. Determine the heating capacity of the coil and the surface temperature required if the by-pass factor of the coil is 0.32. Also determine the capacity of the humidifier. | CO4 | 20 |
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| 7. | a. | Define the following terms:   1. Mach Number, 2. Compressible flow, 3. Velocity of sound, 4. Stagnation temperature and 5. Stagnation pressure. | CO2 | 10 |
| b. | Air (Cp =1.05 kJ/kg.K, γ =1.38) at P1 = 3 X 105 N/m2 and T1=500K flows with a velocity of 200 m/s in a 30 cm diameter duct. Calculate the following:  i) Mass flow rate,  ii) Stagnation temperature, and  iii) Stagnation pressure. | CO2 | 10 |
| **(OR)** | | | | |
| 8. |  | A nozzle in a wind tunnel gives a test section Mach number of 2. Air enters the nozzle from a large reservoir at 0.69 bar and 310K. The cross sectional area of the throat is 1000 cm2. Determine the following quantities for the tunnel for one dimensional isentropic flow:  i) Pressure, temperature and velocity at the throat and test section.  ii) Mass flow rate, and  iii) Power required for driving the compressor. | CO2 | 20 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Discuss the construction and working of a ramjet engine with a suitable sketch. | CO3 | 10 |
| b. | Discuss the construction and working of a open cycle gas turbine with a neat sketch. | CO3 | 10 |