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



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

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| **Code :** | **17ME2018** | **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. | Explain pressure lubrication system 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, 2. Brake thermal efficiency. | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | Discuss the valve timing diagram of a four stroke diesel engine with a neat sketch. | CO1 | 10 |
| b. | 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 (i) Indicated power, (ii) brake power, (iii) the mechanical efficiency of the engine. | CO1 | 10 |
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| 3. | a. | Derive an expression for the air standard efficiency of an Brayton cycle. Plot the cycle on PV and TS diagram. | CO2 | 10 |
| b. | A spark ignition engine works on an air standard Otto cycle that has a heat addition of 1860 kJ/kg and a compression ratio of 8. The pressure and temperature at the commencement of compression process are 1 bar and 288 K respectively. Determine the heat rejection and the thermal efficiency. | CO2 | 10 |
| **(OR)** | | | | |
| 4. | a. | In a dual cycle, the pressure and temperature at the beginning of compression are 1.03 bar and 303 K. Maximum pressure is 41.4 bar and temperature at the end of heat supply is 1666 K. The compression ratio is 12. Find the total heat supplied per kg of air. | CO2 | 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. | CO2 | 5 |
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| 5. | a. | Explain year round air conditioning system with a neat sketch. | CO3 | 10 |
| b. | Write short notes on the following:   1. RSHF line, 2. Split Air conditioner. | CO3 | 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 DBT & 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. | CO3 | 20 |
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| 7. |  | 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  iii) Power required driving the compressor. | CO4 | 20 |
| **(OR)** | | | | |
| 8. |  | Air at P0 =10 bar, T0 =400 K is supplied to a 50 mm diameter pipe. The friction factor for the pipe surface is 0.002. If the Mach number changes from 3 at entry to 1 at the exit determine   1. The length of the pipe 2. The mass flow rate. | CO5 | 20 |
|  | | **Compulsory**: |  |  |
| 9. | a. | With neat sketch, explain the construction and working of Turbojet Engine. | CO6 | 10 |
| b. | Discuss about the construction and working of a closed cycle gas turbine with a neat sketch. | CO6 | 10 |