Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

I SEMESTER M.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2017

SUBJECT: COMBUSTION AND EMISSION [AAE 5104]

REVISED CREDIT SYSTEM
(23/11/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.
- Use of Combustion data hand book is permitted.

1A. A truck fuel (D2 grade) has a specific gravity of 0.81 and a 50% distillation temperature of 524 K. Calculate the Cetane Index for this fuel. **(05)**

1B. Explain the various constituents of the earth's atmosphere. Discuss Green House Effect **(05)**

2A. Find the adiabatic flame temperature of Bituminous coal burned with 50% excess air at 25 degree Celsius and 1 atm. The as-received ultimate analysis of the coal is 70% (wt) carbon, 5% hydrogen, 15% oxygen, 5% moisture and 5% ash. Neglect dissociation and neglect the ash. Enthalpy of formation of Bituminous coal is -1081 kJ/kg. **(05)**

2B. Explain consecutive and competitive reactions with suitable examples. **(05)**

3A. For the dissociation of carbon di oxide , find the mole fraction of various species at 2000 K and pressure of 1 atm. **(05)**

3B. Derive expression for equilibrium constant in terms of mole fraction and pressure. **(05)**

4A. A closed chamber initially contains 2000 ppm of CO, 3% O_2 and the reminder N_2 at 1500 K and 1 atmosphere pressure. Determine the time for 90% of the CO to react assuming only elementary reaction: $CO+O_2 \rightarrow CO_2+O$. Given the kinetic rate constant k=2.5×10^6 exp(-24060/T) $gmol^{-1}.m^{-3}.s^{-1}$, where T is the absolute temperature. **(05)**

4B. What is SMOG and acid rains? How is it caused? **(05)**

5A. List the methods that can be employed to control emission in I C Engines. With a neat sketch explain EGR and its limitations **(05)**

5B. With a neat sketch explain Non-dispersive Infrared Detectors and dilution tunnels. **(05)**