Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

V SEMESTER B.TECH. (MECHANICAL ENGINEERING and INDUSTRIAL AND PRODUCTION ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: THEORY OF INTERNAL COMBUSTION ENGINES AND EMISSIONS [MME 4036]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Include figures wherever necessary

1A. With the help of PV and TS diagrams discuss the processes of a Stirling cycle. **2**

1B. Discuss the merits of using Hydrogen as an alternative fuel for IC engines. **3**

1C. Discuss dissociation. What are its effects on maximum temperature of combustion and brake power of an engine? Which engines, SI or CI, are more affected by it? Give reasons. **5**

2A. Define octane number. Describe how octane number is measured. **2**

2B. What are the performance characteristics of an engine affected by front end volatility of a fuel? Explain. **4**

2C. A hydrocarbon fuel contains 86% carbon and 13% hydrogen by mass and remaining is incombustible material. 25 kg of air is supplied per kg of fuel. Find the percentage of excess air. If the exhaust gases are at 1 bar and 430^{o}C and room temperature is 30^{0}C, find the heat carried away by exhaust gases. **4**

C_p(dry gases)=1kJ/kgK
C_p(water)= 4.187kJ/kgK
C_p(steam)=2.1 kJ/kgK
h_{fg} of water at 1 bar= 2258.9kJ/kgK

3A.	Discuss how time factors affect knocking in a SI engine.	**2**
3B.	List the different methods of producing swirl in Indirect injection engine. With a sketch describe the working of the mechanical diesel fuel injection system.	**4**
3C.	With a labelled diagram explain the working of an Indirect injection engine. Describe four factors affecting delay period in CI engines.	**4**
4A.	Compare knock in SI engines with diesel knock.	**2**
4B.	Discuss the particulate matter emissions in a spark ignition engines.	**3**
4C.	Describe the combustion inside a stratified charge engine with neat sketches. What are its merits?	**5**
5A.	Briefly discuss three sources of exhaust emissions of unburnt hydrocarbons. Include neat figures wherever required.	**3**
5B.	Explain the working of a thermal reactor with a neat figure.	**3**
5C.	What is blowby? With a neat figure, describe how the problem of blowby is solved in modern cars.	**4**