Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B. TECH. END SEMESTER ONLINE EXAMINATIONS, JANUARY-FEBRUARY 2021

SUBJECT: INTERNAL COMBUSTION ENGINES [MME 4303]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. An engineer wants to reduce cost of production of a multi-cylinder SI engine. In this regard, he replaces the multiple cylinders by a large, single cylinder of same volume capacity. Is this justifiable? What is the effect on second stage of combustion? Discuss with suitable reasons. **(03)**

1B. Explain the effect of change in compression ratio of the engine and the specific heat ratio (k) of the working fluid on the thermal efficiency of an ideal Otto cycle. Which among air (k=1.4), argon (k=1.67), and ethane (k=1.2) returns with highest efficiency? Discuss whether a compression ratio of 20 in an Otto cycle is suitable or not. **(04)**

1C. Explain the construction and working of an IC engine in which one thermodynamic phase completes in 270°. **(03)**

2A. Explain the effect of increase in alcohol content on the detonation in an SI engine. **(03)**

2B. What is vapor lock? How is it related to ASTM distillation curve of the fuel? **(04)**

2C. Diesel fuel was mistakenly filled in a petrol engine car. The driver unknowingly starts the car. Explain the next consequences with proper reasoning. **(03)**

3A. A biker fills up a 10 liter can with petrol (as backup) at Kolkata and rides to the Himalayan ranges. He uses this backup petrol in the Himalayas. On his way back, the petrol tank is fueled completely at a fuel station in the Himalayas and rides down south. **(03)**

Explain the consequences of using the backup petrol in the Himalayas as well as

using the petrol fueled at a Himalayan fuel station while riding south.

3B. Explain the effect of alcohol addition to diesel on the engine performance. **(02)**

3C. In a rural village, an old homemaker is using firewood as fuel for cooking in a closed kitchen having a chimney. She uses a pipe to blow air for the fire to set in. Due to its nature of combustion, a lot of carbon monoxide gases are released. **(05)**

(i) How is carbon monoxide formed during combustion and how is blowing of air affecting the release of carbon monoxide gas?

(ii) Suggest and explain a suitable method to remove the carbon monoxide gas from the room.

4A. A researcher intends to use hydrogen as a fuel in an IC engine. Suggest different methods using which hydrogen can be incorporated as a fuel. Comment on the most suitable and safe method with suitable reasons. **(05)**

4B. An engine service mechanic erroneously interchanged inlet and outlet valves by mistake. What are the consequences when the engine is cranked? **(02)**

4C. Explain cut-off ratio and elucidate the effect of increasing cut-off ratio on the thermal efficiency using a neat diagram. **(03)**

5A. A farmer has a biogas plant running on animal waste. The gas produced is used for cooking purpose. The produced gas is in surplus and it is intended to be used by the farmer to run agricultural pump sets. Suggest a suitable method on how the surplus gas can be used and discuss with a simple schematic. **(03)**

5B. Name and explain the thermodynamic cycle shown in Figure 1 and write the expression for thermal efficiency of the cycle. In what ways can the thermal efficiency be increased? **(03)**

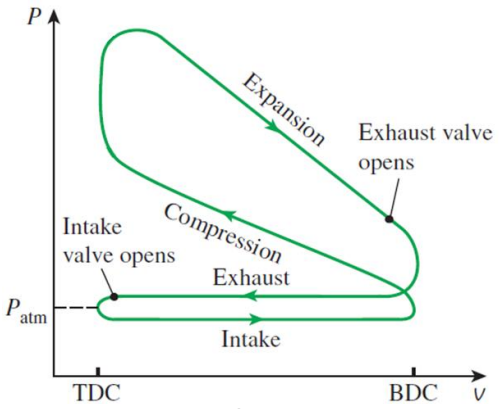

Figure 1

5C. Elaborate on the various advancements in fuel injection systems for SI engines. Compare the same with the conventional engine. **(04)**

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