Code No: ME1517   **GEC-R14**

II B. Tech II Semester Regular Examinations, April 2017
THERMAL ENGINEERING-I
(Mechanical Engineering)

Time: 3 Hours   **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B**. All Questions carry equal Marks.

PART-A
6 × 2 = 12M

1. Draw port timing diagram for 2-stroke petrol engine.

2. State law of conservation of mass in combustion process.

3. Define volumetric efficiency in case of I.C engines.

4. What is the effect of clearance volume on the work input to a reciprocating air compressor.

5. Mention any three significant consequences of surging.

6. What are the applications of gas turbines?

PART-B
4 × 12 = 48M

1. a) What are the differences between air standard cycle and fuel-air cycle analysis ?   (6M)

   b) List out the differences between the wet sump and dry sump lubrication systems.   (6M)

2. a) Explain the working of Orsat apparatus with a neat sketch.   (8M)

   b) Differentiate between theoretical and actual combustion process.   (4M)

3. a) A petrol engine working on four stroke develops a brake power of 20.9 kW. A Morse test was conducted on this engine and the brake power (kW) obtained when each cylinder was made inoperative by short circuiting the spark plug are 14.9, 14.3, 14.8, and 14.5 respectively. The test was conducted at constant speed. Find the indicated power, mechanical efficiency and bmep when all the cylinders are firing. The bore of the engine is 75 mm and stroke is 90 mm. The engine is running at 3000 rpm.   (8M)

b) What are the various pollutants released from an automobile? Briefly explain their effects on environment. (4M)

4. A single acting air compressor draws in 5 m³ / min of air at 1 bar and 20⁰C and delivers it at 8 bar. The compression follows the law $pV^{1.35}$ = C. Neglect clearance. Compare the indicated power required if the following methods are adopted.

i) Single stage compression.

ii) Two stage compression with best intercooler pressure and perfect inter cooling.

iii) Two stage compression with the same intercooler pressure as in (b) but the cooling is not perfect and the temperature of intercooled air can be brought to 25° C.

iv) Three stage compression with perfect inter cooling.
Assume R = 287 J /kg K. (12M)

5. a) With a neat sketch explain the working of centrifugal compressor. (6M)

b) List out the differences between centrifugal and axial flow compressors.

(6M)

6. a) A simple gas turbine cycle works with a pressure ratio of 8. The compressor and turbine inlet temperatures are 300 K and 800 K respectively. If the volume flow rate of air is 250 m³/s, compute the power output and thermal efficiency. Take density of air=1.16kg/m³, Cp=1.005kJ/kg-K. (6M)

b) Prove that the pressure ratio for the maximum specific output is the square root of the pressure ratio for the maximum thermal efficiency.

(6M)

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