

**Government College of Engineering Aurangabad**

(An Autonomous Institute of Government of Maharashtra)

**B.E.(Mechanical-Rev)Examination**

End Semester Examination Nov-2016

**M.E.441: INTERNAL COMBUSTION ENGINE AND TURBINES**

*Time: Three hours*

16 NOV 2016

*Max. Marks: 60*

*“Verify the Course Code and check whether you have got correct question paper”*

*N.B.:-*

- 1. All questions are compulsory*
- 2. All questions carry equal marks*
- 3. Assume suitable data if necessary and state clearly*
- 4. Use of non-programmable calculator is allowed*

**Q1. Attempt any Two**

Q1a. Give detail working and comparisons of four stroke petrol and diesel engine

Q1b. Explain the criteria for selection of firing order and its effect on performance of engine?

Q1c. Define the disadvantages of simple carburetor and explain with neat figure the working of complete carburetor?

**Q2. Attempt any Two**

Q2a. Explain the stages of combustion in SI Engine with Pressure with crank angle diagram?

Q2b. Analysis and explain the stages of combustion in CI Engine?

Q2c. Explain in detail the effect of flame propagation on detonation

**Q3. Attempt any Two**

Q3a. Derive the equations for performance measurement by willians line method and motoring method?

Q3b. A four cylinder four stroke S.I. Engine has a compression ratio of 8 and bore of 100mm, with stroke equal to bore. The volumetric efficiency of each cylinder is equal to 75%. The engine operates at a speed of 4800rpm with an air-fuel ratio 15.

The calorific value of fuel =42MJ/kg, atmospheric density =1.12kg/m<sup>3</sup> mean effective pressure in the cylinder=10bar and mechanical efficiency of the engine =80%, determine the indicated thermal efficiency and the brake power?

Q3c In a trial of a single-cylinder oil-engine working on dual cycle, the following observations were made: Compression ratio=15; oil consumption=10.2kg/h; calorific value of fuel=43890kJ/kg; Air consumption=3.8kg/min; Speed=1900rpm; Torque on the brake drum=186N-m; quantity of cooling water used=15.5kg/min; Temperature rise=36°C; Exhaust gas temperature=410°C; Room temperature=20°C; Cp for exhaust gas=1.17kJ/kgK, Calculate :i) Brake power; ii) Brake specific fuel consumption; iii) Brake thermal efficiency, Draw heat balance sheet on minute basis.

**Q4. Attempt any Two**

Q4a. What are the constituents of exhaust gas of IC Engine and explain the reasons for formation of these constituents in the IC Engine exhaust gas?

Q4b. Explain the performance and disadvantage of alternate fuels Alcohols and hydrogen

Q4c. Explain with neat figure the working of stratified engine what are its advantages over conventional engine

**Q5. Attempt any Two**

Q5a. Explain the working of open cycle simple gas turbine and evaluate the derivation for thermal efficiency of gas turbine?

Q5b. The gas turbine has overall pressure ratio of 5:1 and maximum cycle temperature of 550°C. The turbine drives the compressor and electric generator, the mechanical efficiency of the drive being 97%. The ambient temperature is 20°C and the isentropic efficiencies for the compressor and turbine are 0.8 and 0.83 respectively. Calculate the power output in kilowatts for an air flow of 15kg/s. Calculate also the thermal efficiency and work ratio. Neglect changes in kinetic energy, and the loss of pressure in combustion chamber?

Q5c. Derive the equation for optimum pressure ratio for maximum specific output of the simple gas turbine cycle?