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Name.....

Reg. No.....



**FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
OCTOBER 2012**

ME 09 504—IC ENGINES AND GAS TURBINES

(2009 Scheme)

Time : Three Hours

Maximum : 70 Marks

*Answer all questions.
Assume any missing data suitably.*

Part A

- I. (a) Define Otto cycle.
(b) Explain about governing of IC engines.
(c) What is Morse test ?
(d) Define Detonation.
(e) What is an axial flow turbine ?

(5 × 2 = 10 marks)

Part B

- II. (a) Explain ideal and actual cycles for IC engine.
(b) Write short notes on cooling system of an IC engine.
(c) Explain the battery ignition system with a neat sketch.
(d) List out the various factors which affect combustion in IC engine.
(e) What is Pre-ignition ? Explain its effect.
(f) Write short notes on the performance of a gas turbine.

(4 × 5 = 20 marks)

Part C

- III. (a) In an air standard Otto cycle, the compression ratio is 7 and the compression begins at 1 bar and 313 K the heat added is 2510 kJ/kg. Find : (1) maximum temperature and pressure of the cycle; (2) Work done per kg of air; (3) cycle efficiency; and (4) mean effective pressure. (For air, $C_v = 0.713$ kJ/kgK and $R = 0.287$ kJ/kgK).

(10 marks)

Or

- (b) For an engine working on the ideal Dual cycle, the compression ratio is 10 and the maximum pressure is limited to 70 bar. If the heat supplied is 1980 kJ/kg, find the pressure and temperature at the various salient points of the cycle and the cycle efficiency. The pressure and temperature of air at the commencement of compression are 1 bar and 100°C respectively. Assume $C_p = 1.004$ kJ/kgK and $C_v = 0.717$ kJ/kgK for air.

(10 marks)

Turn over

- IV. (a) (i) Explain with a neat sketch the principle of exhaust turbo charging of a single cylinder engine. (5 marks)
- (ii) What is meant by supercharging ? and list out the limitations of supercharging in an IC engine. (5 marks)

Or

- (b) (i) Explain the construction and operation of a free piston engine with a neat sketch. (4 marks)
- (ii) What are the different types of cooling systems used in modern automobile explain with neat sketch ? (6 marks)
- V. (a) Explain the following types of combustion chamber with neat sketch.
- (i) Direct combustion chamber. (iii) Pre-combustion chamber.
- (ii) Turbulent chamber. (iv) Energy cell. (10 marks)

Or

- (b) (i) Distinguish clearly between 'Octane Number' and 'Cetane Number' What is their significance in rating of fuel ? (4 marks)
- (ii) What is Detonation ? Explain the process of detonation. (3 marks)
- (iii) Explain the different factors affecting detonation. (3 marks)
- VI. (a) Explain the working principle of a simple gas turbine cycle with intercooled cycle, with the schematic diagram and derive the expression for specific work output and maximum efficiency. Draw also the p-V and T-s Diagrams of the cycle. (10 marks)

Or

- (b) With neat sketches explain the working of closed cycle arrangements and discuss the advantages and disadvantages of closed cycle system over open cycle system. (10 marks)

[4 × 10 = 40 marks]