SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2010

ME 04 601—I.C. ENGINES AND GAS TURBINES

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer all *questions.*

Part A

1. List the important I.C. Engine parts.

2. The bore and stroke of an engine working on the otto cycle are 17 cm and 30 cm respectively. The clearance volume is 0.001025 m^3. Find the compression ratio.

3. Differentiate quality governing and quantity governing in I.C. engines.

4. What is a stratified charge engine ?

5. What are the basic requirements of a good S.I. engine combustion chamber. Name any *four*.

6. Name the stages of combustion in a C.I. engine. Draw the P-θ diagram.

7. Draw the P-v and T-s diagrams for the simple gas turbine cycle with reheat and heat exchanger.

8. What are the basic requirements of a gas turbine combustion chamber ?

$(8 \times 5 = 40$ marks)

Part B

9. (a) Derive an expression for the air standard efficiency of a dual combustion cycle.

   (b) Explain the scavenging process in two-stroke engine. What is meant by blow down?

$(8 + 7 = 15$ marks)

Or

10. (a) Compare the relative advantages and disadvantages of four-stroke and two-stroke cycle engines.

    (b) Explain with P-v diagram the loss due to variation in specific heat in otto cycle.

$(7 + 8 = 15$ marks)

11. (a) Sketch and explain the fuel consumption loop in the S.I. engine.

    (b) Discuss with the help of a suitable sketch, the wet sump lubricating system.

$(7 + 8 = 15$ marks)

Or

Turn over

12. (a) Describe a battery ignition system with a help of a sketch.

(b) The following readings were obtained from a test on a single cylinder oil engine working on the four-stroke cycle.

Area of the indicator diagram = 4.1 cm², length if indicator diagram 6.25 cm, indicator spring rating = 0.9 mm, cylinder bore = 10.5 cm, engine stroke 15 cm, mean diameter of brake wheel = 0.6 m brake load = 188 N spring balance reading = 30 N, engine speed = 480 RPM.

Calculate the brake power, indicated power and mechanical efficiency.

(7 + 8 = 15 marks)

13. (a) What is meant by combustion induced swirl ? Show with sketches two important designs of CI combustion chamber using this method of swirl.

(b) Write a note on octane number and cetane number.

(10 + 5 = 15 marks)

Or

14. (a) What are the disadvantages of :

1 T-head combustion chamber ; and

2 Side value combustion chamber.

(b) Explain the phenomenon of diesel knock. Compare it with the phenomenon of detonation in S.I. engine.

(c) Name any four factors which affect the tendency of detonation.

(6 + 5 + 4 = 15 marks)

15. (a) Discuss the effect of impeller Blade shape on performance of a centrifugal compressor.

(b) The poly tropic efficiency of the compressor is 85%. If the ideal outlet temperature of the compressor is twice of the inlet, calculate the isentropic efficiency of the compressor. If the polytropic efficiency of the turbine is same as the compressor calculate the isentropic efficiency of the turbine, assuming that there is no pressure loss. Take $\sqrt{air} = 1.4$ $\sqrt{gas} = 1.33$.

(7 + 8 = 15 marks)

Or

16. (a) Show that the specific work output is maximum when the pressure ratio is such that the compressor outlet and turbine outlet temperatures are equal.

(b) Define degree of reaction. Show that when the degree of reaction is 50%, the blades are symmetrical.

(7 + 8 = 15 marks)

[4 × 15 = 60 marks]