C 18251 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2011

ME 04 601—IC ENGINES AND GAS TURBINES

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

1. Give the broad classification of IC Engines.
2. Define compression ratio. What is its value for SI and CI engine ?
3. What is supercharging of IC engines ?
4. What are the advantages and disadvantages of using a thermostat in the cooling system ?
5. What is detonation in SI engines ?
6. Sketch "M" combustion chamber.
7. Draw the P-V and T-S diagrams for the simple gas turbine cycle with intercooler and reheater.
8. Explain the phenomenon of surging and stalling in an axial flow compressors.

(8 × 5 = 40 marks)

Part B

9. (a) Compare the CI and SI engines for the following factors :—

   (i) Combustion. (ii) Governing.

   (iii) Operating pressure. (iv) Operating speed.

   (b) An ideal diesel engine has a diameter of 15 cm. and strokes 20 cm. The clearance volume is 10% of the swept volume. Determine the compression ratio and the air standard efficiency of the engine if the cut-off takes place at 6 per cent of the stroke.

(8 + 7 = 15 marks)

Or

10. (a) Derive an expression for the air standard efficiency of the diesel engine.

    (b) Discuss the difference between ideal and actual valve timing diagram of a petrol engine.

(7 + 8 = 15 marks)

Turn over

11. (a) Describe with sketches the working principle of Wankel combustion engine.

(b) A Morse Test on a turbo charged 12 cylinder 2 stroke compression ignition oil engine of bore 38 cm. and stroke 50 cm. gave the following readings speed = 200 RPM :—

Condition		Brake load (N)	Condition		Brake load (N)
All firing	...	2040	No. 1 out	....	1830
No. 2 out	...	1850	No. 3 out	...	1850
No. 4 out	...	1830	No. 5 out	...	1855
No. 6 out	...	1840	No. 7 out	...	1835
No. 8 out	...	1860	No. 9 out	...	1820
No. 10 out	...	1840	No. 11 out	...	1830
No. 12 out	...	1830			

The dynamometer constant is 1350.

Calculate the brake mean effective pressure in bars and mechanical efficiency.

(7 + 8 = 15 marks)

Or

12. (a) Enlist and discuss the important properties of a lubricant which effect the engine performance.

(b) Describe a method to find the friction power of a multicylinder diesel engine.

(7 + 8 = 15 marks)

13. (a) Explain the stages of combustion in a CI engine.

(b) What are the basic requirements of a good SI engine combustion chamber.

(7 + 8 = 15 marks)

Or

14. (a) How SI engine fuels are rated ? Write a note on additives in petrol.

(b) What is meant by ignition limits ? What are the ignition for different hydrocarbons ?

(7 + 8 = 15 marks)

15. (a) What are the various possibility of combustion chambers arrangements of a gas turbine ?

(b) A Brayton cycle works between 1 bar 300 K and 5 bar, 1250 K. There are two stages of compression with perfect intercooling and two stages of expansion. The work output of the first stage expansion being used to drive the two compressors where the interstage pressure is optimised for the compressor. The air from the first stage turbine is again heated to 1250 K and expanded. Calculate the power output of free power turbine with and without a perfect heat exchanger and compare them.

(5 + 10 = 15 marks)

Or

16. (a) Draw the schematic arrangement of a gas turbine cycle with intercooling, reheating and regenerator. Show the process on T-S and P-V diagram. Draw also the trends of specific output and the efficiency of the cycle as a function of pressure ratio.

(b) A 10 stage axial flow compressor provides an overall pressure ratio of 5 : 1 with an overall isentropic efficiency of 87 %. When the temperature of air at inlet is 15° C., the work is equally divided between the stages. A 50 % reaction is used with a blade speed of 210 m./sec. and a constant axial velocity of 170 m./sec. Estimate the blade angles. Assume a work done factor of 1.

(7 + 8 = 15 marks)

[4 × 15 = 60 marks]