Hall Ticket No | | | | | | | | | | | Question Paper Code: AME007

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations(Regular) - May, 2018

Regulation: IARE – R16

Applied Thermodynamics

Time: 3 Hours **(ME)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Describe the working principle of 4 Stroke SI engine with help of neat sketch. **[7M]**
   (b) What are the functional requirements of **[7M]**
      i. Fuel injection system of CI engine
      ii. Ignition system of SI engine
2. (a) Draw and explain port timing diagram of a 2-stroke petrol engine. **[7M]**
   (b) What is carburation? Explain the factors affecting the carburation. **[7M]**

UNIT – II

3. (a) Briefly explain the stages of combustion in SI engine with help of p-θ diagram. **[7M]**
   (b) Discuss the effect of various engine parameters on delay period of CI engine combustion. **[7M]**
4. (a) What are the general objectives in designing the SI engine combustion chamber? **[7M]**
   (b) Explain the phenomenon of Knocking in CI engine. Enumerate the factors that effect Knocking in CI engine. **[7M]**

UNIT – III

5. (a) A single cylinder 4- stroke cycle oil engine works on diesel cycle. The following readings were taken when engine running at full load: Area of indicator diagram= 3 cm^2, length of indicator diagram = 4 cm, spring constant= 10 bar/cm, N= 400 rpm, load on the brake= 380 N, spring reading= 50 N, diameter of the brake drum= 120 cm, Fuel consumption = 2.8 kg/hr, C.V. of fuel = 42000 kJ/kg, diameter of the cylinder = 16 cm, stroke = 20 cm. Find
      i) frictional power
      ii) mechanical efficiency
      iii) brake thermal efficiency and
      iv) BMEP. **[7M]**
   (b) Differentiate between Reciprocating compressors and Rotary compressors. **[7M]**
6. (a) What are various methods to determine the friction power of an IC engine? Explain about any one method in detail. **[7M]**
   (b) What is the function of compressor. Give a broad classification of compressors. **[7M]**

UNIT – IV

7. (a) How an impeller and diffuser do functions in centrifugal compressor? Explain with help of pressure and velocity variation graph. **[7M]**

   (b) Determine the work required by an axial flow compressor having eight stages with 50% reaction to compress the air for the pressure ratio of 4:1. The air enters the compressor at 20^0C and flows through it with a constant speed of 90 m/s. The rotating blades of compressor rotate with a mean speed of 180 m/s. Isentropic efficiency of the compressor may be taken as 82%. Also determine the blade angles. **[7M]**

8. (a) Air at temperature of 300 K flows through in a centrifugal compressor running at 18000 rpm. The other data given as follows: **[7M]**
   Isentropic total head efficiency = 76%
   Outer diameter of blade tip = 550 mm
   Slip factor = 0.82
   Calculate the temperature rise as the air passing through the compressor and the static pressure ratio

   (b) Prove that for a 50% reaction staging in axial flow compressor the stator and rotor blades are in symmetry. **[7M]**

UNIT – V

9. (a) How under cooling and superheating of refrigerant affects the performance of vapor compression refrigeration system. **[7M]**

   (b) An air refrigeration system working on Bell-Coleman cycle takes air into the compressor at 1 bar and -5°C. It is compressed in the compressor to 5 bar and cooled to 25°C at the same pressure. It is further expanded in expander to 1 bar and discharged to take the cooling load. The isentropic efficiency of expander and compressor are 85% and 90% respectively. Find Refrigeration capacity of the system for 40 kg/min air circulation, capacity of motor required to run the compressor and C.O.P of the system. **[7M]**

10. (a) With help of neat diagram explain the working of vapour absorption refrigeration system. **[7M]**

    (b) What is refrigerant? What are the desired properties of refrigerant? Explain in detail. **[7M]**

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