Hall Ticket No | | | | | | | | | | | Question Paper Code: AMEB09

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Regular/Supplementary) - July, 2021

Regulation: R18

APPLIED THERMODYNAMICS-I

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

Answer FIVE Questions choosing ONE question from each module
(NOTE: Provision is given to answer TWO questions from any ONE module)
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Describe with a suitable sketch the two-stroke cycle spark ignition (SI) engine. **[7M]**
   (b) List out the main parts of internal combustion engines i) Cylinder ii) Cylinder head iii) Piston iv) Piston rings v) Gudgeon pin vi) Connecting rod vii) Crank viii) Crankshaft ix)Engine bearing x) Crankcase **[7M]**

2. (a) Enlist the different methods of cooling an I.C. engine and explain them with neat sketch. **[7M]**
   (b) What are the different variables that effect knocking in a CI engine? "Can an operator usually able to control those effects"? Explain. **[7M]**

MODULE – II

3. (a) Distinguish between open combustion chamber with divided combustion chamber. **[7M]**
   (b) In what respect four-stroke diesel cycle (Compression Ignition) engine differs from four stroke cycle spark ignition engine? Elucidate. **[7M]**

4. (a) Discuss the desirable characteristics of diesel as a fuel in an IC engine. **[7M]**
   (b) Why firing order is important to run an IC engine. Mention firing order of four-stroke four cylinders and six cylinder engines. **[7M]**

MODULE – III

5. (a) What is the significance of heat balance sheet? Discuss the procedure to draw heat balance sheet for CI engine. **[7M]**
   (b) A single stage reciprocating air compressor is required to compress 1 kg of air from 1 bar to 5 bar. The initial temperature is 27^0C. Compare the work requirement in the following cases. i)Isothermal process ii)Polytropic compression with $PV^{1.2}$=constant and iii) Isentropic compression **[7M]**

6. (a) Explain the phenomenon of knocking in SI engines. What are the different factors influencing the knocking? **[7M]**

(b) During test on single cylinder oil engine, working on the four stroke cycle fitted with a rope brake, the following readings are taken. Effective diameter of brake wheel = 600 mm. Dead load on brake = 200 N; spring balance reading = 30 N; speed = 450RPM; Area of indicator diagram = 400 mm^2; length of indicator diagram = 60 mm; spring scale = 1.1 bar per mm. Bore = 100mm; stroke = 150 mm; Quantity of oil = 0.815 kg/hr. Calorific value of oil = 42000 kJ/kg. Calculate the brake power, indicated power, mechanical efficiency, brake thermal efficiency and brake specific fuel consumption and indicated thermal efficiency. **[7M]**

MODULE – IV

7. (a) With neat sketch explain the construction and working principle of roots blower. **[7M]**

   (b) A roots blower compresses 0.08 m^3 of air from 1.0 bar to 1.5 bar per revolution.Calculate the compressor efficiency. **[7M]**

8. (a) What are the merits of rotary compressor over reciprocating compressor? **[7M]**

   (b) A multi stage axial flow compressor delivers 20 kg/sec of air. The inlet stagnation condition is 1 bar and 17^0 C. The power consumed by the compressor is 4350 kW .
   Calculate i) The delivery pressure ii)Number of stages iii) Overall isentropic efficiency of the compressor. **[7M]**

MODULE – V

9. (a) What are the desirable properties of an ideal refrigerant? Discuss. **[7M]**

   (b) An A/C room is to be maintained at 20^0C and the atmospheric temperature is 40^0C. The power required to run the compressor is 5 kW. Determine capacity of the refrigerator when relative COP is 50%. **[7M]**

10. (a) What are the different types of mechanical refrigeration system? Explain in detail. **[7M]**

    (b) An air refrigerator working on Bell-coleman cycle has pressure limits of 1 bar and 4 bar. The temperature of air entering the compressor is 15^0C and entering the expansion cylinder is 30^0C. The compression follows the law $PV^{1.35}$= C. The expansion follows the law $PV^{1.25}$= C.
    Find i) C.O.P ii) If mass flow rate of air is 0.417 kg/sec, find the refrigeration capacity of the system. Take for air C_p = 1.005 kJ/kg K; C_v= 0.718kJ/kg R= 0.287 kJ/kg K **[7M]**

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