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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Regular / Supplementary) - May, 2019

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) Explain the ideal and actual port timing diagram of a 2-stroke SI engine. **[7M]**

   (b) What are the different variables that effects knocking in an SI engine can an operator usually able to control those effects explain? **[7M]**

2. (a) Describe the importance of lubrication system in CI engine? Describe any one type of lubrication system in CI engine. **[7M]**

   (b) Explain briefly the Diesel cycle with the help of p-v and T-S diagrams and derive an expression for the ideal efficiency of a Diesel cycle. **[7M]**

UNIT – II

3. (a) Explain the phases of combustion in a C.I engine and explain them in brief with neat sketch. **[7M]**

   (b) Find the mean effective pressure and torque developed by the engine in the previous problem if its rating is 4 kW at 1500 rpm. **[7M]**

4. (a) Explain what are the reasons for abnormal combustion of CI engine. **[7M]**

   (b) Why do we feel the necessity of cooling an IC engine? Explain briefly the following methods of cooling IC engines: Air-cooling and Liquid - cooling? **[7M]**

UNIT – III

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

   (b) During the trail of a single cylinder 4-stroke oil engine the following results were obtained. Cycinder bore 20cm, stroke 40cm, MEP 5 bar torque 407 N-m, speed 250rpm, oil consumption 4kg/h, calorific value 43 MJ/kg, cooling water flow rate 45 kg/min, air used per kg of fuel 30kg, rise in coling water temperature 25 ^{0}C, temperature of exhaust gas is 140^{0}C, mean specific heat of exhaust gas 1kJ/Kg. Find the indicated power, brake power and draw the heat balance sheet for the test in kJ/hr. **[7M]**

6. (a) The fundamental clasification of compressors is made by rotary and reciprocating type. Classify rotary type compressors in detail with line diagrams. **[7M]**

   (b) A roots blower compressors 0.06 m^3 of air from 1 bar to 1.45 bar per revolution. Calculate compressor efficiency. **[7M]**

UNIT – IV

7. (a) Explain with a neat sketch, the working of a centrifugal compressor and obtain an expression for the work done. **[7M]**

   (b) A rotary compressor working between 1 bar and 2.5 bar has internal external diameters of impeller as 30^0 mm and 60^0 mm respectively.The vane angle at inlet and outlet are 30^0 and 45^0 respectively.If the air enters the impeller at 15 m/s. find speed of the impeller in rpm and workdone by the compressor per kg of air. **[7M]**

8. (a) Deduce the equation for polytypic efficiency of compressor? **[7M]**

   (b) An 8 stage axial flow compressor takes in air at 20^0 at the rate of 180 kg/min the pressure ratio is 3 and isentropic efficiency is 0.9. Determine the power required. **[7M]**

UNIT – V

9. (a) Draw the layout of vapour compression refrigeration system. State the function of each of the component and show the themodynamic process on a p-h diagram. **[7M]**

   (b) A vapour compression refrigerator uses methyl chloride (R-40) and operates between temperature limits of -10^0C and 45^0C. At entry to the compressor, the refrigerant is dry saturated and after compression it aquires a temperature of 600C. Find the COP of the refrigerator. Use the following data in Table.1. **[7M]**

   Saturation Temperature Enthalpy kJ/kg Entropy kJ/kgK

Table 1

Saturation Temperature	Enthalpy kJ/kg		Entropy kJ/kgK	
	liquid	vapour	liquid	vapour
-10^0C	45.4	460.7	0.183	1.637
45^0C	133.0	483.6	0.485	1.587

10. (a) Describe briefly with the help of a diagram, the vapour absorption system of refrigeration. **[7M]**

    (b) A refrigeration machine using R-12 as a refrigerant operates between the pressure 2.5 bar and 9 bar. The compression is isentropic and there is no under cooling in the condenser. The vapour is in dry saturated condition at the beginning of the compression.estimate the theoretical coefficient of performance.if the actual coefficient of performance is 0.65 of theoretical value, calculate net cooling produced per hour. The refrigent flow is 5 kg per minute. **[7M]**

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