IH Used Paper BTECH-13-10-20

R16

Code No: 135BP

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, October - 2020
THERMAL ENGINEERING – I
(Mechanical Engineering)

Time: 2 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Draw the ideal and actual indicator diagrams of a two-stroke SI engine. How are they different from a four stroke cycle engine?
b) Explain the significance of stroke to bore ratio on IC Engine performance. [8+7]

2.a) Discuss the various characteristics of an efficient cooling system.
b) What are the limitations of simple carburetor and how to rectify them? Explain. [8+7]

3.a) Explain different stages of combustion in S.I. Engine along with p-θ diagram.
b) What is Octane number? Explain how S.I. engine fuels are rated. [8+7]

4.a) What is the difference between physical delay and chemical delay? Explain its importance.
b) Explain the phenomenon of Knock in C.I. engines. [8+7]

5.a) Develop an expression for the calculation of indicated power of an engine.
b) A four cylinder, four stroke petrol engine has a 10 cm bore, 15 cm stroke and uses a compression ratio of 6. The engine develops 25 kW indicated power at 2000 rpm. Find the mean indicated pressure and air standard efficiency. Also calculate the fuel consumption per hour, if the indicated thermal efficiency is 30%. Take the calorific value of fuel as 42 MJ/kg. [7+8]

6.a) Compare and differentiate among the fan, blower and compressor.
b) The free air delivered by a single stage, double acting air compressor measured at 1.013 bar and 15^0C is 14 m^3/min. The pressure and temperature in the cylinder during induction are 0.95 bar and 32^0C. The delivery pressure is 7 bar and the index of compression and expansion, n =1.3. If the clearance volume is 5% of the swept volume, calculate the indicated power and volumetric efficiency. [7+8]

7.a) What is degree of reaction? Derive the expression for degree of reaction for axial flow compressor.
b) An axial flow compressor having eight stages and with 50% reaction compresses air in the pressure ratio of 4:1. The air enters the compressor at 20^0C and flows through it with a constant speed of 90m/s. The rotating blades of compressor rotate with a mean speed of 180m/s. Isentropic efficiency of the compressor may be taken as 82%. Calculate: i) Work done by the machine, ii) Blades angles. [8+7]

8.a) Explain the working principle of Libr-Water vapor absorption refrigeration system with a neat sketch.

b) In a 15 TR ammonia refrigeration plant, the condensing temperature is 25^0 C and evaporating temperature is -10^0 C. The refrigerant ammonia is sub cooled by 5^0 C before passing through the throttle valve. The vapor leaving the evaporator is 0.97 dry. Find COP and power required to drive the plant? Take CP_l = 4.6 kJ/kg-K, CP_V =2.8 kJ/kg-K respectively. [8+7]

---ooOoo---

IH Used Paper BTECH-13-10-20