

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (AE) (Sem.–3rd)
APPLIED THERMODYNAMICS
Subject Code : AE-205
Paper ID : [A0704]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students has to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students has to attempt any **TWO** questions.

SECTION-A

1. Answer briefly :

- (a) Name various types of fuels.
- (b) What are alternative fuels? Give some of their advantages.
- (c) Give classification of air compressor.
- (d) What is intercooling in multistage compression ?
- (e) Define surging and choking in axial flow compressor.
- (f) Define different modes of heat transfer.
- (g) Name various types of heat exchangers.
- (h) Define moist air and relative humidity.
- (i) What are the thermodynamic properties of an ideal refrigerants?
- (j) Name at least five commonly used refrigerants.

SECTION-B

2. What is meant by ignition temperature of fuel ? Why should an ideal fuel have moderate value for ignition temperature ?

3. With the help of a neat sketch, explain the working of centrifugal air compressor, clearly explaining the pressure changes taking place in the passage of air.
4. Explain the difference between heat transfer and thermodynamics. Explain the phenomenon of heat transfer through conduction by citing some examples.
5. Name different type of heat exchanges explaining any one of them.
6. What are refrigerants ? How are they classified ? List some desirable properties of a good refrigerant.

SECTION-C

7. For fuel oil with ultimate analysis
 $C = 82.7$, $H = 12.5$, $S = 0.9$, $N = 2.7$ and $O = 1.2$. With 25% excess air and complete combustion, determine dry gas analysis based on CO_2 , O_2 and N_2 . Assume dry air supplied. Also find gas volume per kg of fuel at $200^\circ C$ and 1.01325 bar.
8. A two cylinder, single acting air compressor is to deliver 15 kg/min of free air from the atmospheric condition of 1 bar (100 kPa) and $27^\circ C$. The delivery pressure is 7 bar (700 kPa), clearance is 4% of the stroke and the index for both compression and expansion is 1.3.
 The compressor is directly coupled to a 4 cylinder, 4 stroke petrol engine running at 1800 r.p.m. The bmep of the engine is 6 bar (600 kPa). Assuming stroke to bore ratio of 1.1 for both engine and compressor and mechanical efficiency of 85% for the compressor, calculate cylinder dimensions for both.
9. At air water vapour mixture at $25^\circ C$ and 1 bar has a relative humidity of 75%. Determine.
 - (a) the partial pressure of water vapour and dry air
 - (b) the specific volume of each constituent
 - (c) the dew point, the specific humidity and the saturation ratio.
 - (d) the density of the mixture.

Also find the amount of water vapour condensed, if the mixture is cooled at constant pressure to a temperature of $10^\circ C$.