



B.Tech III Year I Semester Regular Examinations, NOV/DEC 2019

THERMAL ENGINEERING – I  
(MECHANICAL ENGINEERING)

Maximum Marks: 70

Date: 27.11.2019 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
  2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
  4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Differentiate between 2-stroke and 4- stroke engines.
- 2 Sketch actual valve timing diagram.
- 3 Define pre ignition in engines.
- 4 Explain diesel knock.
- 5 Classify compressors.
- 6 Define break power of engines.
- 7 What are positive displacement compressors.
- 8 Define degree of reaction in axial flow compressors.
- 9 Define C.O.P and unit of refrigeration.
- 10 Define sub cooling in vapour compression refrigeration system.

Part-B

Answer All the following questions.

(10MX 5=50Marks)

- 11 A. Enumerate the reasons for deviation of actual cycles from air standard cycles. [5M]  
B. Explain fuel injection system of SI engine. [5M]

OR

- 12 A. Sketch a simple carburetor and explain its working. [5M]  
B. What are the lubrication systems used in engines. [5M]
- 13 Explain the stages of combustion in case of CI engines. [10M]

OR

- 14 What are the requirements of combustion chamber for SI engines, mention some types of SI engine combustion chamber. [10M]



- 15 An engine is required to develop 100kW, the mechanical efficiency of the engine is 86% and the engine uses 55kg/hr of fuel. Due to improvement in the design and operating conditions, there is reduction in engine friction to the extent of 4.8kW. If the indicated thermal efficiency remains the same, determine the saving in fuel in kg/hr. [10M]

OR

- 16 Derive the expression for work done in a 2-Stage reciprocating air compressor and show the amount of work saved on P-V graph. [10M]
- 17 Explain the working of Lysholm compressor. [10M]

OR

- 18 An axial flow compressor with overall isentropic efficiency of 85% draws air at 20°C and compresses it in the pressure ratio of 4:1. The mean blade speed and flow velocity are constant throughout the compressor. Assuming 50% reaction blading and taking blade velocity as 180m/s and work input factor as 0.82. Take  $\alpha_1=12^\circ$   $\beta_1=42^\circ$  calculate: (i) Flow velocity (ii) Number of stages. [10M]

- 19 A 5 ton refrigerating machine operating on Bell Coleman cycle has pressure limits of 10 bar and 1 bar. The temperature of air before compression is 10°C. The compressed air is cooled to 40°C before it enters an expander. Assuming both compression and expansion to be adiabatic with  $\gamma=1.4$ . Determine

(i) COP

(ii) Mass of air circulated per min

(iii) Power rating of motor assuming 90% mechanical efficiency

Assume  $C_p=1.0$  kJ/kg-K

[10M]

OR

- 20 A. What are types of air conditioning systems. [5M]  
B. Define wet bulb and Dry bulb temperature. Also indicate constant DBT and WBT lines on Psychrometric chart sketch. [5M]