Reg. No. : | | | | | | | | | | |

Question Paper Code: 34704

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Fourth Semester

Mechanical Engineering

01UME404 – THERMAL ENGINEERING

(Regulation 2013)

(Use of Steam table, Psychrometric chart are permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. A Carnot cycle works between the temperatures 300*K* and 700*K*. Find the maximum work possible per kg of air.
2. Define mean effective pressure.
3. What are various methods to determine the FHP of the engine?
4. What are the exhaust emissions from a diesel engine?
5. What is critical pressure ratio of a steam nozzle?
6. What is blading efficiency?
7. Indicate the applications of reciprocating compressors in industry.
8. Define clearance ratio of an air compressor.
9. Give the advantages of subcooling and superheating.
10. Define Ton of refrigeration.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Derive an expression for the air standard efficiency of Brayton (Joule) cycle in terms of pressure ratio. (12)

(ii) The efficiency of an Otto cycle is 60% and $\gamma = 1.5$. What is the compression ratio? (4)

Or

(b) Draw the actual and theoretical p-v diagrams of a four stroke diesel engine and compare them. (16)

12. (a) (i) Explain why cooling is necessary in an I.C. engine. (4)

(ii) With neat sketches describe the working of water cooling system used for multi-cylinder engine. (12)

Or

(b) (i) Explain the working of 4-stroke cycle diesel engine with neat sketch. (10)

(ii) Differentiate between the SI and CI engines. (6)

13. (a) (i) Discuss the principle of operation of a shaper with a neat sketch. (10)

(ii) Discuss the various hole making processes. (6)

Or

(b) Steam at 10.5 *bar* and 0.95 dryness is expanded through a convergent-divergent nozzle. The pressure of steam leaving the nozzle is 0.85 *bar*. Find, (i) velocity of steam at throat for maximum discharge (ii) area at exit (iii) steam discharge if the throat area is 1.2 cm^2. Assume the flow is isentropic and there are no friction losses. Take $n=1.135$. (16)

14. (a) (i) Explain the working principle of centerless grinding process. (8)

(ii) Explain the working mechanism of cylindrical grinding. (8)

Or

(b) (i) State the advantages and disadvantages of staging of compressors. (8)

(ii) A two stage air compressor compresses air from 1bar 20^{o}C to 42 bar. It follows PV1.35=C. The inter cooling is perfect. Find

(a) WD

(b) mass of cooling water needed in inter cooler if water temperature raise is 25^{o}C. (8)

15. (a) With help of a suitable sketch explain the working of lithium bromide-water based vapour absorption system. Also list the advantages and disadvantages of vapour absorption systems. (16)

Or

(b) Explain with neat sketch about the Vapour Li-Br vapor absorption Refrigeration system. (16)