R20 Regulation *Subject code: 3P4CF*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech IV Semester Regular/Supplementary Examinations, September 2023

THERMAL ENGINEERING - I

(MECHANICAL ENGINEERING)

Maximum Marks: 70 Date:23.09.2023 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 Sketch actual and practical valve timing diagram of SI engine.
2 Give two differences between petrol and diesel engines.
3 Discuss anti –knock additives.
4 Define Cetane number.
5 Define Isothermal efficiency of compressors.
6 Define brake power in IC engines.
7 Define work done factor in axial flow compressors.
8 Sketch and label the parts of Roots Blower Compressor.
9 Define unit of refrigeration.
10 Define (i)Wet bulb temperature (ii) Specific humidity.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 a) Differentiate between 2-Stroke and 4-Stroke engines. [5M]
b) Explain the battery Ignition system with the help of a circuit diagram. [5M]

OR

12 a) Explain fuel injection system for SI engines. [5M]
b) Why lubrication is required in engines, explain splash lubrication system. [5M]

13 a) Explain the stages of combustion in case of CI engines with the help of P-V diagram. [5M]
b) Enlist the various methods of producing turbulence of air in diesel engines for combustion. [5M]

OR

14 a) Explain the phenomenon of knocking in SI engines. [5M]
b) What are the types of combustion chamber for SI engines. [5M]

15 A two-stroke cycle internal combustion engine has a mean effective pressure of 6 bar. The speed of the engine is 1000 r.p.m. If the diameter of piston and stroke are 110 mm and 140 mm respectively, find the indicated power developed. [10M]

OR

16 a) Discuss the effect of clearance volume on performance of reciprocating air compressor. [5M]
b) Classify compressors. [5M]

17 Explain in the construction and working of Lysholm compressor with the help of a sketch. [10M]

OR

18 In an axial flow compressor, the overall stagnation pressure ratio achieved is 4 with overall stagnation isentropic efficiency 86percent. The inlet stagnation pressure and temperature are 1 bar and 320K. The mean blade speed is 190 m/s. the degree of reaction is 0.5 at the mean radius with relative air angles of 10^0 and 30^0 at rotor inlet and outlet respectively. The work done factor is 0.9. Calculate: [10M]

(i) Stagnation polytropic efficiency

(ii) Number of stages

(iii) Inlet temperature and pressure

(iv) Blade height in the first stage if the hub-tip ratio is 0.4, mass flow rate is 20kg/s.

19 a) Explain the principle of operation of air refrigeration system and draw P-V graph. [5M]
b) Derive COP of simple vapour compression refrigeration system. [5M]

OR

20 a) Represent the following process on psychrometric chart
(i) Cooling & Humidification (ii) Sensible heating [5M]

b) The atmospheric conditions are 25°C DBT and specific humidity of 10 gm/kg of air, Determine the following (i) partial pressure of vapour (ii) Relative Humidity (iii) Dew point Temperature. Take atmospheric pressure as 1 Bar. [5M]