R20 Regulation *Subject code: 3P4CF*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, December 2024

THERMAL ENGINEERING-I
(Mechanical Engineering)

Maximum Marks: 70 Date:12.12.2024 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)		CO	Bloom Tx
1	Define indicated power.	1	L1
2	List the advantages of valve timing diagram.	1	L1
3	What is called flame front and flame velocity?	2	L1
4	Write the difference between Pre-ignition and auto-ignition?	2	L1
5	What are the various losses of IC Engine?	3	L1
6	Draw the PV-diagram for two stage reciprocating air compressors?	3	L1
7	What is meant by ton of refrigeration	4	L1
8	Define Cetane number.	4	L1
9	What is COP of refrigeration system?	5	L1
10	List out the advantages of reciprocating compressors.	5	L1
	Part-B		
Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
11	Explain cooling system for IC engines. [10M]	1	L2
	OR		
12	Explain Battery ignition system with a neat diagram. [10M]	1	L2
13	State and explain different combustion stages in SI engine. [10M]	2	L2
	OR		
14	What are the types of fuel injection systems? Explain any one with a neat sketch? [10M]	2	L2
15	A six cylinder, four-stroke gasoline engine having a bore of 90 mm and stroke of 100 mm has a compression ratio 7. The relative efficiency is 55% when the indicated specific fuel consumption is 300gm/kW h. Estimate (i) the calorific value of the fuel and (ii) corresponding fuel consumption, given that imep is 8.5 bar and speed. [10M]	3	L2
	OR		

16	Explain reciprocating air compressor. [10M]	3	L2
17	A centrifugal compressor running at 8000 rpm delivers 660m^3/min of free air. The air is compressed from 1.01 bar and 15^{0}C to a pressure of 3 with an isentropic efficiency of 80%. Blades are radial at outlet of impeller and flow velocity of 60 m/s may be assume throughout constant. The outer radius of impeller is thrice the inner and the slip factor may be assumed as 0.8.The blade area coefficient may be assumed 0.8 at inlet. Calculate: a)Final temperature of air b) Theoretical power c) Impeller diameters at inlet and outlet d) Breadth of impeller at inlet e) Impeller blade angle at inlet f) Diffuser blade angle at inlet. [10M]	4	L2
	OR		
18	A multistage axial compressor is required for compressing air at 293 K through a pressure ratio of 5 to 1. Each stage is to be 50% reaction and the mean blade speed 275 m/s, flow coefficient 0.5, and stage loading factor 0.3, are taken, for simplicity, as constant for all stages. Determine the flow angles and the number of stages required if the stage efficiency is 88.8%. Assume C_P =1.005 kJ/kg K and γ= 1.4 for air. [10M]	4	L2
19	Explain the working of Vapour compression refrigeration system with a neat diagram [10M]	5	L2
	OR		
20	A Bell-Coleman refrigerator works between 4 bar and 1 bar pressure limits. After compression, the cooling water reduces the air temperature to 17^{0}C. What is the lowest temperature produced by the ideal machine? Compare the coefficient of performance of this machine with that of the ideal Carnot cycle machine working between the same pressure limits, the temperature at the beginning of compression being -13^0 C [10M]	5	L2