



R20 Regulation

Subject code: 3P4CF

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, February 2024

THERMAL ENGINEERING - I

(MECHANICAL ENGINEERING)

Maximum Marks: 70

Date: 26.04.2024 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	Sketch port timing diagram of SI engine.	CO1	L1
2	Give two differences between 2-Stroke and 4-Stroke engines.	CO1	L1
3	Define cetane Number.	CO2	L1
4	What is Diesel knock.	CO2	L1
5	What is perfect intercooling in reciprocating air compressors.	CO3	L1
6	Define indicated power in IC engines.	CO3	L1
7	Define slip factor in centrifugal compressors.	CO4	L1
8	Sketch and label the parts of vane sealed compressor.	CO4	L1
9	Write the applications of air refrigeration system.	CO5	L1
10	Define (i)Wet bulb Temperature(ii) Dew point temperature.	CO5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)			
11	a. Sketch and explain actual and air standard Otto cycle. [5M] b. Explain the working of a simple carburetor with the help of a neat sketch. [5M]	CO1	L2 L2
OR			
12	a. Explain Fuel injection systems for CI engines. [5M] b. Why Cooling is required for engines, explain any one type of engine cooling system. [5M]	CO1	L2 L2
13	a. Explain the need of air movement during suction and compression for diesel engine combustion. How it is obtained. [5M] b. Discuss various types of combustion chambers used in diesel engines. [5M]	CO2	L2 L2
OR			
14	a. Explain the phenomenon of Knocking in SI engines. [5M] b. Discuss on fuel rating in SI engines. [5M]	CO2	L2 L2
15	a. Explain the significance of Heat Balance sheet. [4M] b. A single-cylinder, four-stroke cycle oil engine is fitted with a rope brake.	CO3	L2 L3

	The diameter of the brake wheel is 600 mm and the rope diameter is 26 mm. The dead load on the brake is 200 N and the spring balance reads 30 N. If the engine runs at 450 r.p.m., what will be the brake power of the engine? [6M]		
	OR		
16	a. Derive volumetric efficiency of a reciprocating compressor. [5M] b. Differentiate between fan, blower and compressor. [5M]	CO3	L2 L2
17	A centrifugal compressor is designed to have a pressure ratio of 3.5:1. The inlet eye of the compressor impeller is 30cm in diameter. The axial velocity at inlet is 130 m/s and the mass flow is 10kg/s. The velocity in the delivery duct is 115 m/s the tip speed of the impeller is 450m/s and runs at 16,000 r.p.m. with total head isentropic efficiency of 78% and the pressure coefficient of 0.72. The ambient conditions are 1.013 bar and 15°C. Calculate: i. The static pressure ratio ii. The static pressure and temperature at inlet and outlet of compressor iii. Work of compressor per kg of air, and iv. The theoretical power required. [10M]	CO4	L3
	OR		
18	A multi stage axial flow compressor delivers 18kg/s of air. The inlet stagnation condition is 1bar and 20°C. The power consumed by the compressor is 4,260KW. calculate: i. Delivery pressure ii. Number of stages iii. Overall isentropic efficiency of the compressor Assume temperature rise in the first stage is 18°C, the polytropic efficiency of compression is 0.9 and the stage stagnation pressure ratio is constant. [10M]	CO4	L3
19	a. Explain the working of vapour compression refrigeration system with the help of layout diagram and P-H graphs [5M] b. Compare Vapour compression and Vapour absorption refrigeration system. [5M]	CO5	L2 L2
	OR		
20	a. Define psychrometry and state its significance. [5M] b. Represent the following processes on psychrometric chart [5M] (i) Heating and humidification (ii) Sensible cooling	CO5	L2 L2