



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code: 3P5CC

B.Tech V Semester Regular Examinations, January 2023

THERMAL ENGINEERING-II (Mechanical Engineering)

Maximum Marks: 70

Date: 11.01.2023 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 Name the methods to improve the Rankine cycle performance or efficiency.
- 2 Define the terms Boiler Efficiency.
- 3 Explain the function of nozzles used with steam turbines.
- 4 Write a short note on Degree of under cooling.
- 5 Distinguish between impulse and reaction turbine.
- 6 How the term friction does effects the combined velocity triangle.
- 7 What are the various sources of air leakage into a steam condenser?
- 8 What is a gas turbine?
- 9 What is meant by thrust?
- 10 What is the principle of Rockets?

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 (a) Explain Concept of mean Temperature of heat addition. [5]
(b) A steam power plant is supplied with dry saturated steam at a pressure of 12 bar and exhausts into a condenser at 0.1 bar. Calculate Rankine efficiency using steam tables or Mollier chart. [5]

OR

- 12 Describe with a neat sketch, the construction & working of a Babcock and Wilcox water tube boiler. [10]
- 13 (a) Dry saturated steam at a pressure of 10 bar is expanded in a nozzle to a pressure of 0.7 bar. With the help of Mollier diagram find the velocity and dryness fraction of steam issuing from the nozzle, if the friction is neglected. Also find the velocity and dryness fraction of steam, if 15% of the heat drop is lost in friction. [6]
(b) Explain what is meant by critical pressure ratio of a nozzle. [4]

OR

- 14 (a) Derive an expression for maximum discharge through convergent divergent nozzle for steam. [5]
 (b) What are the effects of supersaturation on discharge and heat drop? [5]
- 15 (a) Define the term 'degree of reaction' as applied to a reaction turbine. Show that for a Parson's reaction turbine, the degree of reaction is 50 percent. [5]
 (b) Explain the term 'Compounding of steam turbine'. What are the different methods of reducing rotor speed? [5]

OR

- 16 The velocity of steam, leaving the nozzles of an impulse turbine, is 1200 m/s and the nozzle angle is 20° . The blade velocity is 375 m/s and the blade velocity coefficient is 0.75. Assuming no loss due to shock at inlet, calculate for a mass flow rate of 0.5 kg/s and symmetrical blading: (i) Blade inlet angle (ii) driving force on wheel (iii) axial thrust on wheel and (iv) power developed by the turbine. [10]
- 17 (a) Describe with a neat sketch the working of a surface condenser. [5]
 (b) What do you understand by the term vacuum efficiency of a condensing plant? On what factors does this efficiency depend? [5]

OR

- 18 (a) Differentiate between a closed cycle gas turbine and open cycle gas turbine. [5]
 (b) State the assumptions made for thermal efficiency of a gas turbine plant. [5]
- 19 (a) Write and explain the performance evaluation thrust augmentation methods. [5]
 (b) State the fundamental differences between the jet propulsion and rocket propulsion. [5]

OR

- 20 (a) Explain the advantages and disadvantages of a Turbo-jet engine. [5]
 (b) Classify the types of Rocket engines and also write their applications. [5]

NOTE: ALLOWED STEAM TABLES