Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: B.Tech**
Sub_Code: RME7D001

7th Semester Regular/Back Examination: 2024-25
SUBJECT: Power Plant Engineering
BRANCH(S): MECH
Time: 3 Hours
Max Marks: 100
Q.Code: R104

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is the primary purpose of a steam generator?
b) What is the function of an air-preheater?
c) What is a sub critical boiler?
d) How do natural circulation and forced circulation differ from each other?
e) What is the purpose of an economizer?
f) What is super saturated flow in the context of nozzles?
g) What is meant by nozzle governing?
h) What do you mean by mass defect and binding energy?
i) What are peak load and peak load plants?
j) What is the significance of incremental rate for a power plant?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) What are the key features of a fire tube boiler, and how does it differ from a water tube boiler?
b) What are boiler mountings and accessories, and what are their functions?
c) How are boiler performance calculations carried out, and what parameters are considered?
d) What do critical pressure and choked flow refer to in the context of nozzles?
e) Can you illustrate the velocity diagrams for impulse blading?
f) What is the operating principle of a cooling tower?
g) How is the performance of a steam condenser calculated?
h) Describe the main features of a CANDU-type reactor with a sketch.
i) Explain how energy is released by nuclear fission. What is mass defect?
j) What are the waste disposal methods and safety measures in nuclear power plants?
k) What are the advantages of using a load duration curve in power plant design?
l) What are the methods used to determine the depreciation of a power plant?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 What are the key principles of pulverized coal combustion systems and the fundamental concepts of fluidized bed combustion? **(16)**

Q4 A steam turbine is to develop 8 MW at 5000 rpm for driving a compressor. The steam enters at 40 bar, 500 ^{0}C and exhaust at 0.1 bar. The internal efficiency of the turbine is 0.85 and its mechanical efficiency is 0.96. Estimate (a) the number of impulse stages required, if similar impulse stages are used throughout, (b) the nozzle height for the first stage with full admission. Assume nozzle efficiency as 0.92, nozzle angle 15^0, limiting blade velocity of 300 m/s, and blades operating at maximum efficiency. **(16)**

Q5 Describe a high-level jet condenser. Why is a condenser needed for a steam power plant? Define vacuum efficiency and condenser efficiency. **(16)**

Q6 Explain the characteristic features of Pressurized water Reactor (PWR). What is the function of the pressurizer? How is the power output of a nuclear reactor controlled? **(16)**