

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2024

Subject Code:2171910

Date:16-12-2024

Subject Name: Power Plant Engineering

Time:10:30 AM TO 01:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1**
- (a) Being an engineer what will be your suggestions for the site selection for the thermal power plant. **03**
 - (b) Compare Natural and Artificial draught systems. **04**
 - (c) What is the function of Electrostatic Precipitator in the modern Thermal Power Plant? With simple sketch explain its working. **07**
- Q.2**
- (a) Explain Nuclear fusion and fission with example. **03**
 - (b) State the sources of air leakage in case of steam condenser. **04**
 - (c) Define degree of reaction. With neat sketch draw the velocity diagram of 50% reaction turbine and write the optimum velocity ratio for such case. **07**
- OR**
- (c) Define boiler draught? Derive an expression of Chimney height in terms of mm of water column. **07**
- Q.3**
- (a) Define work ratio. What is practical significance of it in case of Gas Turbine Plant? **03**
 - (b) What is Compounding in case of steam turbine? State its practical significance. **04**
 - (c) Enlist High Pressure Boilers and explain Benson boiler with neat sketch. **07**
- OR**
- Q.3**
- (a) Explain the working principle of Jet Propulsion. **03**
 - (b) Compare Boiling Water reactor (BWR) and Pressurized Water Reactor (PWR). **04**
 - (c) The small power plant in some chemical industry delivers the peak load of 50 MW. The loads having maximum demands of 25 MW, 30 MW, 15 MW and 10 MW are connected to the power plant. The capacity of the power plant is 70 MW and the annual load factor is 0.60. **07**
 - 1. Draw the load curve
 - 2. Determine average load, demand factor.
 - 3. The energy supplied from the power plant per year.
- Q.4**
- (a) Explain the necessity of high pressure boiler. **03**
 - (b) Enlist various ash handling systems and explain briefly any one. **04**
 - (c) What is fast breeder reactor? With neat sketch explain CANDU nuclear reactor. **07**
- OR**
- Q.4**
- (a) Briefly explain the necessity of feed water treatment. **03**
 - (b) With neat sketch explain the working of open cycle gas turbine, also suggest various methods used to improve the performance. **04**
 - (c) With neat sketch explain Unit and Central Pulverization system. **07**
- Q.5**
- (a) What is coal pulverization? Why is it done? **03**
 - (b) Define load factor, demand factor, plant use factor and plant capacity factor. **04**

- (c) A gas turbine power plant operates on Brayton cycle. The maximum and minimum temperatures of the cycle are 750 °C and 25°C respectively. Find pressure ratio for maximum power output. Also determine thermal efficiency, work ratio and power output, if the mass flow rate of air is 1000 kg/min. Take $C_p = 1.005 \text{ kJ/kg K}$ and $\gamma = 1.4$ for compression and expansion process. **07**

OR

- Q.5** (a) Define pressure ratio and its practical significance in case of steam nozzle. **03**
(b) What is De-aeration? With neat sketch explain any one feed water treatment system used in the practice. **04**
(c) Explain Nuclear Power Plant development and its waste and disposal related issues as far India concern. **07**
