

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VI (NEW) - EXAMINATION – SUMMER 2018****Subject Code:2161407****Date:08/05/2018****Subject Name:Food Plant Utilities & Sanitation****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.

- Q.1 (a)** Define boiler as per ASME and list the main components of a water tube boiler. **03**
- (b)** Answer the following: **04**
- (i) State the function of economizer and optimizer in boiler.
 - (ii) Define sterilization
 - (iii) Define Population equivalent of a city.
 - (iv) What are steam traps?
- (c)** What is boiler efficiency? List main factors that affect it. In a boiler performance test, 11400 kg of bituminous coal was consumed in 24 hours generating 14500 kg dry saturated steam at mean absolute pressure of 8 bar. If the calorific value of the coal is 30 MJ/kg and the feed water temperature is maintained uniform at 25 °C, calculate the following: **07**
- (i) Boiler efficiency.
 - (ii) Equivalent evaporation in kg per kg fuel.
- [Take $h_g(8 \text{ bar}) = 2700 \text{ kJ/kg}$, $h_f(25^\circ\text{C}) = 135 \text{ kJ/kg}$, $h_{fg}(100^\circ\text{C}) = 2257 \text{ kJ/kg}$]
- Q.2 (a)** Define draught and state its objectives in boiler operation. **03**
- (b)** A RCC chimney of 15 m height provides natural draft to a boiler exhaust. The chimney is operating under maximum discharge condition. The flue gas and ambient air temperatures are 350 °C and 25 °C respectively. Calculate the following: **04**
- (i) The draught produced in mm WC.
 - (ii) The air supplied in kg per kg of fuel.
- (c)** Write 1-2 lines on each: **07**
- | | | | |
|--------------------|----------|--------------------|------------|
| (i) Water Softener | (ii) QAC | (iii) Power factor | |
| (iv) Food soil | (v) CIP | (vi) SIP | (vii) Grid |
- OR**
- (c)** Answer the following questions briefly: **07**
- (i) What are Aerated Lagoons?
 - (ii) What is SCADA?
 - (iii) Define earthing.
 - (iv) Define COD?
 - (v) What are synchro-phasers?
 - (vi) What is the function of OCB?
 - (vii) Define ultimate BOD.
- Q.3 (a)** Explain the significance of p-H value, Surfactants and Nitrates in relation to effluent treatment. **03**



- (b) Answer the following: 04
- (i) State the characteristics of a good detergent.
 - (ii) Give steps for application of sanitizers.
- (c) Explain the construction & working of a rotary can washer with a neat diagram. 07
- OR**
- Q.3** (a) Define sanitation. State methods of sanitization. 03
- (b) Explain the following: 04
- (i) Scale formation and its control.
 - (ii) Surfactants and their applications.
- (c) Define detergents. Discuss in detail the properties and applications of detergents in food industry. 07
- Q.4** (a) Identify the hazards and their locations in a water system for a food processing plant and suggest measures for controlling these hazards. 03
- (b) Why is oxygen demanded in waste water? Explain BOD and BOD₅ and discuss how BOD₅ can be measured analytically. 04
- (c) Explain biological waste stabilization. Describe the working of trickling filter with neat sketch. 07
- .OR**
- Q.4** (a) Define cleaning & explain the following: (i) De-flocculation, (ii) Peptization (iii) Saponification 03
- (b) Draw a process flow diagram for water supply system to service the following requirements: 04
- (i) Drinking water
 - (ii) Soft water for boiler
 - (iii) Cleaning and sanitation water
 - (iv) De-mineralized water.
- (c) Explain anaerobic waste stabilization. With the help of a neat diagram describe the operation of USABP. 07
- Q.5** (a) Name at least 10 applications of compressed air in food industry. 03
- (b) Discuss briefly: 04
- (i) Diffused aerators.
 - (ii) Significance of $\frac{COD}{BOD_5}$ ratio in ETP operation.
 - (iii) Facultative ponds.
 - (iv) Special cleaning methods.
- (c) Give a typical CIP cleaning cycle for food industry. Explain the following attributes of CIP system. (i) Heating arrangement (ii) Preparation of solution (iii) Operational techniques and cycles. 07
- OR**
- Q.5** (a) Explain briefly: (i) Flow equalization (ii) Culinary steam (iii) Ozonation of water. 03
- (b) Define boil corrosion. Explain methods of treatment of boiler feed water. 04
- (c) Describe various tests to assess the effectiveness of cleaning and sanitation. 07
