Seat No.: _____ Enrolment No.

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 ^{o}C, calculate the following: **07**

(i) Boiler efficiency.
(ii) Equivalent evaporation in kg per kg fuel.

[Take h_g (8 bar) = 2700 kJ/kg, h_f (25^{o}C) = 135 kJ/kg, h_{fg} (100 ^{o}C) = 2257kJ/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 ^{o}C and 25 ^{o}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 BOD_5 and discuss how BOD_5 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**

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