



UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF CHEMICAL AND BIO-ENGINEERING TECHNOLOGY

FINAL EXAMINATION
OCTOBER 2025 SEMESTER

COURSE CODE : CPD22403
COURSE TITLE : PLANT UTILITY & SAFETY
PROGRAMME NAME : DIPLOMA IN CHEMICAL ENGINEERING TECHNOLOGY
DATE : 03 FEBRUARY 2026
TIME : 9:00AM - 11:00AM
DURATION : 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
 2. This question paper is printed on both sides of the paper.
 3. This question paper consist of TWO sections.
 4. Section A consist 25 MCQ or EMQ questions. Answer ALL questions.
 5. Section B consist of four questions. Answer THREE (3) questions only.
 6. Please write your answer on the answer booklet provided.
 7. Please answer all questions in English only.
 8. Please answer MCQ/EMQ questions using OMR sheet. ☒ Tick if applicable
 9. Refer to the attached Formula/ Appendies. ☐ Tick if applicable
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THERE ARE 13 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 25 marks)

Answer ALL questions.

Please use the objective answer sheet provided.

1. Choose the common components of a cooling tower.
 - I. Induced fan.
 - II. Inlet louvers.
 - III. Wood fill.
 - IV. Plastic fill.
 - A. I & II
 - B. II & III
 - C. II, III & IV
 - D. All the above

2. High Alkalinity in the boiler can cause
 - A. Scale in boiler and cooling water.
 - B. Turbine blade deposition.
 - C. Increase corrosion.
 - D. Foaming and carryover of solids with steam.

3. Carbon dioxide in the boiler feed water can be treated by
 - A. Lime soda Softening
 - B. Demineralization.
 - C. Softening solutions.
 - D. Deaeration technique

4. Choose amount of level used in the water treatment process
- A. 1
 - B. 3
 - C. 2
 - D. 4
5. Choose the main components in a LV electrical supply distribution system (building):
- I. kWh meter TNB
 - II. Main Switch Board (MSB)
 - III. Sub Switch Board (SSB)
 - IV. Distribution Board (DB)
- A. I & IV
 - B. All the above
 - C. II & IV
 - D. I & III
6. Choose the component which is not available inside the Distribution Substation
- A. Switch gear
 - B. Low voltage distribution board
 - C. Transformer
 - D. Condenser

7. To maintain the boiler, choose the right methods to prevent the scale formation inside it.
- I. Remove hardness component softener.
 - II. Use sludge dispersants.
 - III. Control boiler water concentration, pH, iron & demineralization.
 - IV. Periodically sample evaporation tubes.
- A. II & IV
 - B. I, III, IV
 - C. I, II
 - D. All the above
8. Choose the best ways to inhibit corrosion in the cooling tower.
- I. Calcium carbonate.
 - II. Dearator.
 - III. Chromates
 - IV. Epoxy
- A. All the above
 - B. I, III, IV
 - C. II, III, IV
 - D. I, II, III
9. Choose type of flow available for cooling tower.
- I. Single way flow.
 - II. Counter flow.
 - III. Double way flow.
 - IV. Cross flow.
- A. I & II
 - B. All the above
 - C. II & III
 - D. II, & IV

10. Choose the wrong steps to increase the efficiency of cooling tower.
- A. Increase quantity of air.
 - B. Increase the filling.
 - C. Increase the height or area of the tower.
 - D. Increase the base of cooling tower
11. _____ is the valve used to prevent dangerous pressure from building up within the boiler.
- A. Steam stops valve.
 - B. Blowdown valve.
 - C. Feed check valve.
 - D. Safety valve.
12. Find the false statement regarding the boiler.
- A. Burners are used to inject a mixture of air and fuel into the combustion chamber.
 - B. The dampers regulate the amount of air that enters the burner.
 - C. The ignitor of the main burner is the pilot burner.
 - D. An ignitor is a component in a gas burner to change fuel into mist.
13. List the common problems faced by the once-through cooling system.
- I. Scaling.
 - II. Corrosion.
 - III. Biological fouling.
 - IV. Deposits.
- A. I & II
 - B. I, III & IV
 - C. I, II & IV
 - D. All the above

14. Deposits consist of two general types: _____ and sludge.
- A. Biofilm.
 - B. Slime.
 - C. Crystalline organic.
 - D. Crystalline inorganic.
15. State the following procedures that cannot protect people from electrical hazards.
- A. Grounding.
 - B. Insulating.
 - C. Guarding.
 - D. Wiring.
16. List the impurities that can be removed from the water by using a filter.
- A. Microorganism.
 - B. Dissolved solids.
 - C. Dissolved gases.
 - D. Suspended solids.
17. Choose the damages that can be protected by a circuit breaker in an electrical circuit.
- I. Fire.
 - II. Overload.
 - III. Short circuit.
 - IV. Electric shock.
- A. I, II & III
 - B. II, III & IV
 - C. I & IV
 - D. II & III

18. Choose the type of transformer that is required to transform from one voltage to the same voltage.
- A. Step-down.
 - B. Step-up.
 - C. Variable.
 - D. Isolating.
19. List the factors used in the selection of the turbine.
- I. Availability.
 - II. Reliability.
 - III. Quality.
 - IV. Demand for the motive gas.
- A. I & III
 - B. II & III
 - C. I, II & III
 - D. All of the above
20. Choose a false statement about the operation of the turbine.
- A. A turbine converts compressed air or steam into mechanical energy to operate plant equipment.
 - B. Turbines use motive gas such as steam, high-pressure process gases, or fuel and air, as a fluid to provide input power.
 - C. A turbine is a type of prime mover, and its main function is as a driver for rotating machinery in process plants.
 - D. Turbine converts the motive gas from lower to higher pressure into mechanical energy to operate rotating equipment.

21. Choose the true statement about the cooling tower.
- A. Natural draft cooling towers are much more widely used.
 - B. Natural draft cooling tower required fans to remove the heat.
 - C. Almost all mechanical draft towers are crossflow designs.
 - D. Mechanical draft towers offer control speed of operation.
22. List the type of water treatment that uses hydrazine in the boiler.
- A. Ion-exchange.
 - B. Demineralization.
 - C. Corrosion inhibitor.
 - D. Oxygen scavenger.
23. Determine the false statement referring to water quality.
- A. Suspended solids can be removed by using filters.
 - B. Concentration of charged particles increases the electrical conductance.
 - C. Dissolved solids are commonly referred to as "total dissolved solids".
 - D. Drinking water should have less than 50 ppm of turbidity.
24. List the effects that are generally caused by scaling in the boiler.
- I. Thermal damage.
 - II. Increased working life of a boiler.
 - III. Unscheduled downtime.
 - IV. Decreased cleaning time.
- A. II & III
 - B. I & II
 - C. II & IV
 - D. I & III

25. List the applications of having a flare system in the plant.
- I. Collect hydrocarbon gases and liquids released from all areas of the site.
 - II. Burning of liquefied petroleum gases.
 - III. Disposes of cryogenic vapour/liquid hydrocarbons.
 - IV. Clearing of pipelines between the plant sites.
- A. II & III
 - B. I & IV
 - C. I, II & III
 - D. I & III

SECTION B (Total: 75 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

The boiler is the heart of the equipment in the plant utility. The main operation is to produce steam and deliver it to the prime movers, especially steam turbines.

- (a) Develop four characteristics each between fire-tube and water-tube boilers.
(8 marks)
- (b) Predict six type of common boilers used in the industries.
(6 marks)
- (c) Prepare five impacts due to boiler scales.
(5 marks)
- (d) Discover the effect of high conductivity in the water and best treatment to reduce its impact
(4 marks)
- (e) Find the carryover that available in the boiler steam drum
(2 marks)

Question 2

Plant utilities are items that are not directly involved in the chemical process but are needed to facilitate the process. These would include the making and delivery of water, steam, gas hot/cold water, electricity, and compressed air.

- (a) Predict four main utilities available in the chemical process plant.
(4 marks)
- (b) The water system consists of a string, purification, and supply to the plant area. Predict four types of water systems and their applications.
(8 marks)
- (c) Find two functions of steam system.
(2 marks)
- (d) Interpret six criteria of the condensate system in the chemical process plant.
(6 marks)
- (e) Discover five objectives of the plant maintenance.
(5 marks)

Question 3

Prime movers in plant utilities are essential machines that convert energy from natural sources into mechanical work, which is then used to drive other machines. They are crucial in various power generation systems, including thermal power plants, hydroelectric plants, and natural gas plants.

- (a) Find the definition of electric motor.
(2 marks)
- (b) Find two types of electrical motor available in the market.
(2 marks)
- (c) Choose four types of electric charge flow for both types of electric motors.
(4 marks)
- (d) In a simple table, Carry out three differences for both type of electric motor available.
(12 marks)
- (e) Choose five tips for efficient motor operation.
(5 marks)

Question 4

A basic electrical power system is the complete arrangement used to generate, transmit, distribute, and use electrical energy safely and reliably. Its main purpose is to deliver electricity from where it is produced to where it is consumed, at the correct voltage, frequency, and quality.

- (a) List nine steps in basic electrical system generation until distribution.
(9 marks)
- (b) In electrical equipment terminology, develop four voltage ratings available in Malaysia.
(8 marks)
- (c) Develop three voltage levels available in primary distribution.
(6 marks)
- (d) Interpret the main function of transformer.
(2 marks)

END OF EXAMINATION PAPER