CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
FEBRUARY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LMB22003**
SUBJECT TITLE	:	**MARINE BOILERS**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**BACHELOR OF MARINE ENGINEERING TECHNOLOGY WITH HONOURS**
TIME / DURATION	:	**2.00 PM - 4.30 PM (2 HOURS 30 MINUTES)**
DATE	:	**28 JUNE 2025**

INSTRUCTIONS TO CANDIDATES

1. Please read **CAREFULLY** the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **ONE (1)** section ONLY.
4. Answer **FOUR (4)** out of FIVE (5) questions ONLY.
5. Please write your answers on this answer booklet provided.
6. Answer **ALL** questions in English language **ONLY**.
7. Steam Table of Properties has been appended for your reference.

THERE ARE 4 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

INSTRUCTION: Answer FOUR (4) questions ONLY. **(Total: 100 marks)**

Please use the answer booklet provided.

Question 1

A marine water tube boiler has experienced several instances of incorrect water level indication on the boiler gauge glass, causing operational uncertainty and risk.

a) Sketch a cross-sectional diagram of a boiler gauge glass assembly. Clearly label at least EIGHT (8) key parts including steam and water valves.

(10 marks)

b) Apply the steps required to carry out a safe "blow-through" test of a boiler gauge glass to verify water level indication.

(6 marks)

c) Analyze three possible causes of false water level indication in a gauge glass and determine how each condition affects boiler safety and performance.

(9 marks)

Question 2

A marine ESD II boiler is in operation onboard a merchant vessel. The final superheated steam temperature is critical for turbine performance and is controlled precisely during varying load conditions.

a) Sketch a cross-sectional view of the ESD II boiler. Clearly label ELEVEN (11) major components including furnace, steam drum, and superheater sections.

(12 marks)

b) Based on your sketch in (a), show the flow direction of water and steam, including the section responsible for final superheat temperature control

(5 marks)

c) Analyze how the final superheat temperature is maintained in the ESD II boiler. Include the principles of temperature control, desuperheating system, and the effect of steam demand on control system response.

(8 marks)

Question 3

A boiler generates 5000 kg of steam/hour at a pressure of 60 bar. The steam temperature is 550°C, and the feed water temperature is 41.5°C. The efficiency of boiler is 92 percent. Neglecting losses, determine:

a) The mass of fuel when using oil of calorific value 45500 kJ/kg

(20 Marks)

b) The fuel cost per kWh if the fuel costs, RM 2500/tonne

(5 Marks)

Question 4

Boiler water quality plays a key role in the safe and efficient operation of a boiler. If the water contains too many impurities, it can cause problems like scale, corrosion, and poor steam quality

a) Apply how the scum valve and bottom blowdown valve are used in managing boiler water quality. Carry out the correct procedure for operating each valve.

(6 marks)

b) The boiler water test reveals excessively high TDS levels. Analyze the implications of high TDS on boiler operation and describe the corrective actions required.

(11 marks)

c) Identify FOUR (4) common sources of boiler water contamination and recommend preventive measures for each.

(8 marks)

Question 5

You are the 3rd Engineer Officer on board a vessel that has just completed a dry-docking period. The ship's high-pressure water tube boiler has been fully shut down and is now required to be brought back into operation from cold conditions

a) As the responsible engineer, you are to prepare, initiate firing, and raise steam till bringing online safely and efficiently. Apply and determine at least SIX (6) key steps for each stages;

i. Preparation stage (6 Marks)

ii. Commencing firing (6 Marks)

iii. Raising Steam and Bringing Boiler Online (6 Marks)

b) Identify SEVEN (7) probable causes for a boiler failing to fire automatically during flash up operation. (7 Marks)

END OF EXAMINATION PAPER