CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
FEBRUARY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LMB30803**
SUBJECT TITLE	:	**MARINE STEAM AND GAS TURBINE**
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	:	**23 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 Properties is attached for reference.

THERE ARE 5 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

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

Please use the answer booklet provided.

Question 1

a) Outline the complete operating cycle of figure: 1 steam in a marine steam turbine propulsion system diagram given, starting from the boiler and ending at the condenser. Include in your explanation the function of each of the following components: high-pressure turbine, low-pressure turbine, astern turbine, flexible couplings, and reduction gearing

(15 Marks)

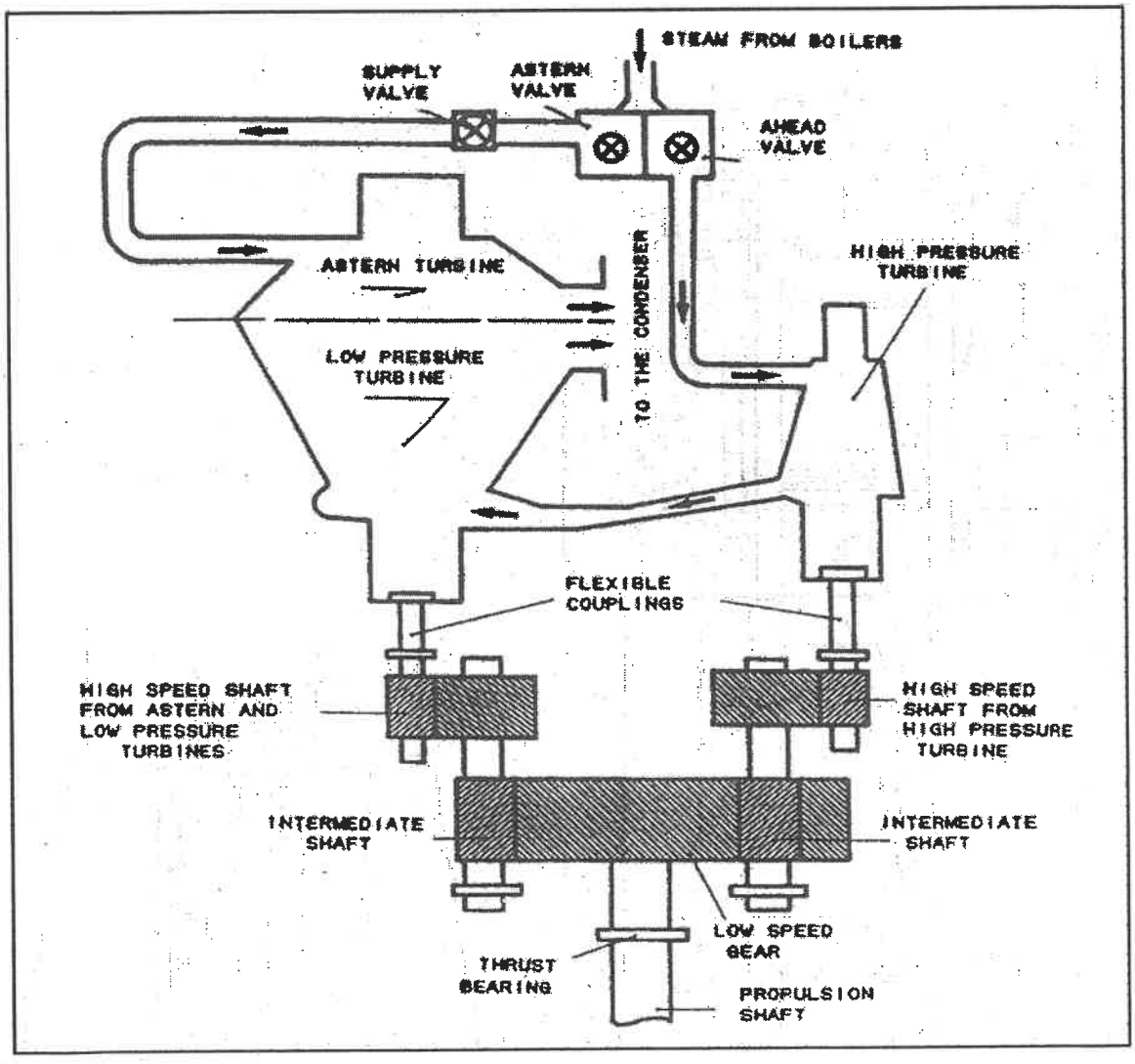

Figure 1: steam turbine propulsion system diagram

b) Based on Figure 1 diagram, identify and describe the role of three shafts in the system. Determine why speed reduction is necessary in marine turbine propulsion.

(5 Marks)

c) Demonstrate how the astern turbine operates independently from the ahead turbine in terms of steam routing and mechanical engagement, and state why this separation is essential for marine propulsion safety.

(5 Marks)

Question 2

With reference to the main steam turbine engine onboard steam ship,

a) sketch the construction of a main steam turbine and label TWELVE (12) major components. Your sketch should represent the general layout of a steam turbine used for marine propulsion,

(12 Marks)

b) Demonstrate the construction and operating principle of a marine steam turbine. Your answer must address the flow of steam from the inlet to the condenser and explain how mechanical work is extracted from steam energy

(9 Marks)

c) Analyze TWO (2) common failure modes in steam turbine operation related to the components shown. Suggest one preventive maintenance action for each

(4 Marks)

Question 3

Steam at a pressure of 60 bar and temperature of 510°C is fed to a steam turbine from a boiler. In the turbine, the steam is expanded isentropically to a pressure of 0.15 bar. The steam is then exhausted into condenser where it is condensed but not undercooled. The condensate is then pumped back into boiler, determine the following by using the Students' Steam Tables, SI units:

(a) The supplied energy to the feed water per kilogram of steam generated (8 Marks)

(b) The dryness fraction of the steam when entering condenser (8 Marks)

(c) Rankine efficiency, (9 Marks)

Question 4

a) With reference to the operation of a marine steam turbine plant, draw a well-labeled diagram of a closed feed water system. Your sketch should include and clearly label FOURTEEN (14) essential components and spill/make line which been used in the system.

(15 Marks)

b) Demonstrate the operational sequence of a closed feed water system in a high-pressure marine steam turbine plant. Your explanation should cover the following elements:

- The flow and transformation of energy throughout the Rankine cycle (generation, expansion, condensation, and feed phases)
- The role of key equipment such as the main condenser, condensate pump, air ejector, evaporator, LP heater, dearator, turbo feed pump, and economizer
- The function of auxiliary tanks including the atmospheric drain tank and feed tank

(10 Marks)

Question 5

You are assigned as the watchkeeping engineer during the operation of a steam turbine propulsion plant. The proper functioning of the Main Turbine Lubricating Oil (LO) system is essential to avoid mechanical failures.

a) Draw EIGHT (8) labels a simplified layout diagram of a Main Turbine Lubricating Oil system, including the major components used to maintain lubrication

(10 Marks)

b) Demonstrate how the Main Turbine Lubricating Oil (LO) system ensures continuous lubrication during both normal operation and power failure, using examples from real shipboard operations.

(11 Marks)

c) The turbine bearing temperature has started to rise unexpectedly. Identify TWO (2) possible causes related to the LO system

(4 Marks)

END OF EXAMINATION PAPER