



**MERCHANT SHIPPING SECRETARIAT**  
**GOVERNMENT OF SRI LANKA**  
**CERTIFICATE OF COMPETENCY EXAMINATION**

GRADE : CHIEF MATE ON SHIPS OF 500 GT OR MORE (UNLIMITED)  
SUBJECT : Electronic Navigation Systems  
DATE : 27.04.2023

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Time allowed **THREE** hours Total marks : 150  
**ANSWER ALL QUESTIONS** Pass marks : 50%

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Formulae and all intermediate steps taken in reaching your answer should be clearly shown. You may draw sketches wherever required. Electronic devices capable of storing and retrieving are **NOT** allowed.

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- 1) Describe the principle of Electromagnetic distance measurement in GPS system. (25 marks)
  
- 2) With aid of a block diagram, describe the LRIT System Components and their purpose. (25 marks)
  
- 3) With aid of a block diagram, show the internal parts and the instruments connected to AIS. (25 marks)
  
- 4) You are on board a vessel at Istanbul where H was recorded to be 13 A/m and Z = 15 A/m whilst the value of Coefficient C was (+)  $7^0$  and that due to Induced C was (-) $2^0$ .
  - a) Determine the total deviation due to Coefficient C on a heading of  $050^0$  off Cape Town where H = 18 A/m and Z = (-) $20$  A/m. (12 marks)
  
  - b) With aid of a sketch explain **any one** of the following:
    - (i) construction of a compass bowl.
    - (ii) H/E correcting system. (04 marks)
  
  - c) (i) With regard to ship's magnetic compass, explain **any one** out of the following and how it could be rectified A, C, and E. (03 marks)
  
  - (ii) Explain what is Lambda, Mu and their use. (03 marks)
  
  - (iii) When correcting or adjusting a ship's magnetic compass, explain why the final correctors recommended are permanent horizontal magnets? (03 marks)
  
- 5) a) Explain any top-heavy method of a gravity control gyroscope by using suitable

sketches.

(10 marks)

- b) Describe how to determine the direction of precession on the above gyroscope.  
(05 marks)
  - c) Draw the path taken by the north end of a controlled gyro situated in NH or SH, indicating relevant vectors.  
(10 marks)
- 6) a) List ten IMO requirements on the performance standard of a Gyro Compass  
(10 marks)
- b) Name errors of the Gyro compass and describe any two of them indicating how to minimize them.  
(10 marks)
  - c) Explain why controlled gyro should be damped to use it as a Gyro compass  
(05 marks)