



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

GRADE : CHIEF MATE ON SHIPS OF 500 GT OR MORE (UNLIMITED)

SUBJECT : Electronic Navigation Systems

DATE : 22nd February 2019

Time allowed **THREE** hours

Total marks : 150

ANSWER ALL QUESTIONS

Pass marks : 50%

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.

- 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 $(+) 7^{\circ}$ and that due to Induced C was $(-) 2^{\circ}$.
 - a) Determine the total deviation due to Coefficient C on a heading of 050° 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)