



**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 : 05<sup>th</sup> April 2018 Time : 0900 – 1200 hrs

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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)
  - 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)
  
- 2)
  - 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 must be damped, so that to use it as a Gyro compass (05 marks)
  
- 3)
  - a) What are main three segments in the GPS system? (10 marks)
  - b) Describe the importance of Clock Synchronization in GPS system. (15 marks)

- 4) Explain the following with regards to LRIT;
- a) Ship equipment
  - b) Communication service provider
  - c) Application service provider
  - d) Datacenters
  - e) International data Exchange
  - f) Data distribution plan
- (25 marks)

- 5)
- a) Describe main parts of the Automatic Identification System  
(20 marks)
  - b) Explain modernization and satellite applications of AIS  
(05 marks)

- 6)
- a) Analyze the following deviations and determine the values of the approximate coefficients:  

N	NE	E	SE	S	SW	W	NW
$8^{\circ}$ W	$3^{\circ}$ E	$7^{\circ}$ E	$6^{\circ}$ E	$8^{\circ}$ E	$7^{\circ}$ E	$3^{\circ}$ W	$12^{\circ}$ E

(11 marks)

- b) With the aid of basic sketches, write short notes on the following:
  - i. H/E correcting system or magnetic compass bowl.
  - ii. The complements on a ship which causes deflection of its mag comp needle.
  - iii. Kelvin deflector

(02 marks each)

- c) Explain the causes for:
  - i. Coefficient E
  - ii. Coefficient J

(04 marks each)