



**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 : 09.08.2019

Time allowed **THREE** hours

Total marks : 155

**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) Explain the procedure followed by a GPS receiver to determine position of a ship. (25 marks)
  
- 2) Describe the following with respect to the ELORAN system
  - a) ELoran Pulse Format (6.25 marks)
  - b) ELoran Data channel (6.25 marks)
  - c) Secondary Coding Delay (6.25 marks)
  - d) Group Repetition Interval (6.25 marks)
  
- 3) Answer the following questions with regard to LRIT and AIS:
  - a) With aid of a sketch diagram, describe the components of LRIT network. (12.5 marks)
  - b) Draw a diagram indicating internal parts and external components connected with an AIS equipment. (12.5 marks)
  
- 4) Fiber optic Gyro compasses are used in modern day navigation replacing conventional mechanical Gyro compass.
  - a) Explain fully how fiber optic gyro compasses works to determine north. (15 marks)
  - b) Sketch and label a block diagram of a fiber optic gyro compass. (10 marks)
  
- 5) a) Sketch and describe the path traced out by the north end of the axle of a liquid controlled gyro-compass damped in tilt, either in North or South Latitudes. (15 marks)
- b) Draw and explain the settling point and the forces holding it in equilibrium at this point. (10 marks)

- 6) Answer the following questions with regard to magnetic compasses:
- With regard to ship's magnetic compass, explain with the aid of sketches what is coefficient C and E.
  - When correcting or adjusting a ship's magnetic compass, what is the order of placing the correctors, and what coefficients do they correct?
  - Elaborate in a sketch a basic compass bowl of a magnetic compass.
- (05 marks each)
- 7) a) Analyze the following deviations observed on ship's head by compass when in North magnetic latitude on a ship with compass sited aft and on starboard side.

N	NE	E	SE	S	SW	W	NW
15° W	1°W	11°E	13°E	15°E	3°E	12°W	14°W

(10 marks)

- b) With the aid of sketches, explain how you would attempt to remove the resulted Coef B?

(05 marks)