**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 : 28th Dec 2023 Time : 1300 Hrs

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. (a) What are main segments in the GPS system

(10 Marks)

(b) Describe the importance of Clock Synchronization in GPS system.

(15 Marks)

1. Explain the following in relation to LRIT
2. Ship equipment
3. Communication service provider
4. Application service provider
5. Data centers
6. International data Exchange

(05 Marks each)

1. (a) Describe main parts of the Automatic Identification System

 (20 Marks)

(b) Explain modernization and satellite applications of AIS

(05 Marks)

1. Fiber optic Gyro compasses are used in modern day navigation replacing conventional mechanical Gyro compass.
2. Explain in detail how fiber optic gyro compasses woks to determine north.

(15 marks)

1. Sketch and label a block diagram of a fiber optic gyro compass.

(10 marks)

1. a) Sketch and describe the path traced out by the north end of the axle of a liquid

controlled gyro-compass that is damped in tilt, either in North or South Latitudes.

(15 marks)

1. Draw and explain the settling point and the forces holding it in equilibrium at this point.

(10 marks)

1. i. Define Coefficient “J

ii. Explain in a simple sketch the H/E correcting system

(2.5 marks each)

1. A vessel is found to possess a H/E (heeling error) of 50 E on a heading 0300 C when heeled 60 to Starboard.

 What would be her H/E on a heading of 3000 C when heeled 40 Port?

(10 marks)

1. Define all following coefficients and explain with the aid of a sketch how any one out of any are minimized or eliminated.

 A, B, C, D and E

(10 marks)