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 : 06th April 2017

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) Mechanical Gyro compass has been used on merchant vessels for decades as a direction finding equipment. Gyro compass has been made using the inherent mature of a precession of free Gyroscope.
   a) Using precession describe how a liquid ballistic control Gyro compass control its North end.

   (10 marks)

   b) With a suitable diagram, explain the forces activating at the north end in following locations of it.
      i) Maximum drifted position at East
      ii) Maximum tilted up position
      iii) Maximum drifted position at West

      (05 marks each)

2) IMO has issued a circular on performance requirement of a Gyro compass.

   a) List at least ten of the requirements

   (10 marks)

   b) **FOC** may be the future direction finding equipment
      i) With a sketch of a block diagram and fiber optic ring describe fully how to find north using Fiber Optic Gyro compass

      (15 marks)

3) You are entrusted with the task to supervise the ship's magnetic compass adjustment process with a qualified compass adjuster whist your vessel is being prepared for reemployment after a 5 months layup.

   a) List down in point form 20 key items you consider important to achieve best results.

   (10 marks)

b) A vessel is supposed to possess a heeling error (H/E) of 5^0 E on a course of 030^0 by Compass when healed 6^0 to Stbd.

i) What would be her H/E when she alters course to 300^0 and healed 4^0 to Port?

(10 marks)

ii) Show in a practical sketch how the compass needle is expected to behave in the above case.

(05 marks)

4) Answer the following questions with regard to GPS & DGPS:

(a) Explain GPS Clock synchronization and measurement of distance to the satellite.

(10 marks)

(b) Describe operation of terrestrial and space based DGPS systems with typical examples.

(15 marks)

5) Answer the following questions with regard to AIS:

(a) What are the main aspects of annual survey of AIS as published by IMO

(15 marks)

(b) Draw a diagram showing the internal and external parts associated with AIS transceiver

(10 marks)

6) Answer the following questions with regard to LRIT & Loran

a) Indicate the main components of LRIT network

(15 marks)

b) State the main difference between Loran-C and present eLoran system and describe what is Eurofix.

(10 marks)