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 : 02nd February 2018

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

(10 marks)

(b) Describe the operation of DGPS systems with examples.

(15 marks)

2)

(a) State the main aspects covered in the annual survey of AIS.

(15 marks)

(b) Describe the long range AIS principles and applications.

(10 marks)

3)

a) What are the main components of the LRIT system.

(15 marks)

b) What is the difference between conventional Loran-C and present eLoran system and describe the pulse format used by Eurofix.

(10 marks)

4)

a) Explain why a controlled Gyro cannot be used as a direction-finding device until it is damped.

(10 marks)

b) Sketch suitable diagrams to show settling position of a Gyro compass damped in Tilt and damped in Azimuth in Northern Hemisphere.

(05 marks)

c) Explain why a Gyro compass damped in tilt does not settle on a meridian and settle slightly off the meridian and above/below the horizon while a Gyro compass damp in azimuth settle on a meridian but slightly above/below the horizon.

(10 marks)

5)

a) List ten requirements on the performance standard of a Gyro Compass.

(05 marks)

b) Explain by using suitable sketches the liquid ballistic controlled Gyro compass.

(10 marks)

c) Enumerate the errors associated with a Gyro Compass and describe one of them in detail.

(10 marks)

6)

a) On a particular day with overcast skies during your passage from Yokohama to Trincomalee, the vessel was swung and the following deviations were obtained on ship's head by compass.

N	NE	E	SE	S	SW	W	NW
10^0E	15^0E	02^0 E	15^0E	10^0W	9^0E	14^0E	07^0E

Analyze the above deviations and determine the values of the approximate coefficients.

(6 marks)

b) Suggest how you would affect corrections to minimize the compass deviations as stated in above (a).

(04 marks)

c) Briefly explain the following:
   i. VFI
   ii. Kelvin deflector
   iii. Illustrate in a sketch the magnetic compass bowl.

(03 marks each)

d) Explain the causes for:
   i. Coefficient B
   ii. Coefficient J

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(03 marks each)