



**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 : 10th Jun 2020

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) Describe the following with respect to the LORAN system
 - a) Pulse Format
 - b) Phase Coding
 - c) Secondary Coding Delay
 - d) Group Repetition Interval
 - e) Envelope and Cycle matching

(05 marks each)

- 2) Show the comparison diagram of transmission signal formats of Basic Loran-C, Eurofix, Ninth-Pulse systems and describe the importance of Secondary Additional Factors (ASF).

(25 marks)

- 3)
 - a) Explain any top heavy method of a gravity controlled 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)

- 4) IMO has issued a circular on performance requirements of a Gyro compass.
 - a) List at least ten of the requirements.

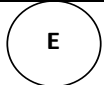



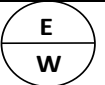
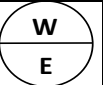




(10 marks)
 - b) Fiber Optic gyro Compass (FOC) may be the future direction finding equipment.
 - i) With a sketch of a block diagram and fiber optic ring describe fully how to find north using Fiber Optic Gyro compass.

(15 marks)

- 5) a) List down the correct order of placing the correctors of a standard magnetic compass whilst its adjustments are being done.
 b) Explain briefly the reasons why should the correctors are required to be placed in that order?
 (05 marks each)
 c) Illustrate in a sketch the basic components of a standard magnetic compass bowl.
 (05 marks)
 d) In the attached table, analyze the following deviations and determine the values of the approximate coefficients:

N NE E SE S SW W NW
 8° W 3° E 7° E 6° E 8° E 7° E 3° W 12° E

(10 marks)

SHIP HEAD	DEV	A		B		C		D		E	
		+	-	+	-	+	-	+	-	+	-
											
N											
NE											
E											
SE											
S											
SW											
W											
NW											

COEF	DEV	E or W