



**MERCHANT SHIPPING SECRETARIAT
GOVERNMENT OF SRI LANKA**

CERTIFICATE OF COMPETENCY EXAMINATION

GRADE : OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF
500 GT OR MORE (UNLIMITED)
SUBJECT : PRINCIPLES OF NAVIGATION
DATE : 27.10.2023

Time allowed THREE hours

Total marks : 180

Answer all questions

Pass marks : 60%

Formulae and all intermediate steps taken in reaching your answer should be clearly shown.
You may draw sketches wherever required.

1) a) Describe the following;

i) Civil Twilight

ii) Nautical Twilight

iii) Astronomical Twilight

(09marks)

b) Explain which Twilight region is suitable to take star observations for navigation.

(05 marks)

c) What are the conditions that must be satisfied for twilight to last all night?

(06 marks)

2) a) List down Inferior and Superior Planets.

(07 marks)

b) Explain the Apparent motion of the planet Jupiter.

(05 marks)

c) The moon was having following elongations. Explain the below.

i) Conjunction

ii) Quadrature

(08 marks)

3) a) List down three common chart projections.

(06 marks)

b) Describe the use of Gnomonic Charts for plotting a great circle track between two points and the procedure of transferring the great circle track to a Mercator Chart.

(08 marks)

c) List the advantages of the Mercator Charts.

(06 marks)

4) a) What is meant by the Equation of Time?

(05 marks)

b) "Equation of Time is considered as composed of two components". Clearly explain the above statement.

(10 marks)

c) Find the equation of time at 1500Hrs GMT, when the GHA of the Sun was $42^{\circ} 04.7'$.

(05 marks)

5) It is required to apply set of corrections to sextant altitude to obtain the true altitude of a celestial body.

Your answer should contain clear explanations of below with suitable diagrams.

- a) Index Error
- b) Dip
- c) Refraction
- d) Semi-diameter
- e) Horizontal Parallax

(20 marks)

6) a) Sketch and describe the arcs of great circles of PZX Spherical triangle.

(08 marks)

b) Describe what is Magnitude of a celestial body and how do you find the magnitude of celestial bodies.

(06 marks)

c) Explain why the planet Venus appears as a Morning and Evening Star.

(06 marks)