DIRECTORATE OF MERCHANT SHIPPING
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 : 13.12.2023

Time allowed THREE hours | Total marks : 120
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)** Explain the phases of the moon with a suitable sketch.

(09 marks)

b) Why does the duration of the Moon's synodic period longer than Sidereal Period?

(06 marks)

c) Describe the Augmentation of the Moon's SD.

(05 marks)

2) **a)** Describe with the aid of a diagram the phases of the Moon.

(08marks)

b) Why does the duration of the Moon's Synodic Period is longer than Sidereal Period

(04 marks)

c) With the aid of a sketch describe3 types of Lunar Eclipses.

(08 marks)

3) **a)** Explain how to find equation of time from Nautical Almanac with a suitable example.

(06 marks)

b) Find the equation of time at 1400hrs GMT, when the GHA of the Sun was 31^{o} 00'.

(08 marks)

c) Describe the following;

i) Sidereal Year ii) Tropical Year (06 marks)

4) **a)** Explain the Kepler's three laws of planetary motion

(10 marks)

b) What are the approximate perihelion and aphelion distances and dates of the earth?

(05marks)

c) With the aid of a diagram explain the Apparent Motion of planet "Jupiter ".

(05 marks)

5) **a)** Describe the following;

i) Civil Twilight
ii) Nautical Twilight
iii) Astronomical Twilight (09 marks)

b) What condition must be satisfied for Twilight to last all night?

(06 marks)

c) Explain the reason why Twilight last longer in higher latitudes.

(05 marks)

6) **a)** Describe the following with suitable diagrams.

i) Elongation
ii) Conjunction
iii) Opposition
iv) Quadrature (14 marks)

b) Calculate the LHA of a star whose RA is 74°, for an observer in longitude 40°E, when GHAγ is 205°.

(06 marks)