Indian Maritime University

(A Central University, Govt of India)

Mar/Apr'26 SE

Programme Name: B Sc Nautical science

Semester: Three

Subject Code: UG21T6305

Subject Name: Celestial Navigation

Date: 09.03.2026	Max Marks: 70
Duration: 03 Hrs	Pass Marks: 35

General Instructions

(i) All Sections (A, B & C) are to be attempted.
(ii) Options, if any, are specified in respective section.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. Centaurus contains the bright star
A. Alpha Centauri
B. Betelgeuse
C. Canopus
D. Vega

2. The altitude of the elevated pole equals
A. The observer's latitude
B. The observer's longitude
C. The declination
D. The zenith distance

3. If variation = 2°E and compass error = 5°E, deviation is
A. 3°E
B. 7°E
C. 3°W
D. 7°W

4. The first point of Aries is used as
A. The reference point for measuring declination
B. The reference point for measuring right ascension and hour angle

C. The point of vernal equinox
D. Both B and C

5. The apparent annual motion of the Sun is caused by
A. The rotation of the Earth on its axis
B. The revolution of the Earth around the Sun
C. The precession of equinoxes
D. The movement of the Moon

6. At the equator, day and night are
A. Equal throughout the year
B. Unequal
C. Longest in summer
D. Shortest in winter

7. If observed altitude of Polaris is 20°, the observer's latitude is approximately
A. 10°N
B. 20°N
C. 40°N
D. 70°N

8. The sides of the PZX triangle are
A. Co-latitude, Co-declination, and Zenith distance
B. Latitude, Declination, and Altitude
C. Declination, Right Ascension, and Hour angle
D. All of the above

9. A solar eclipse occurs when
A. Earth comes between Sun and Moon
B. Moon comes between Sun and Earth
C. Sun comes between Earth and Moon
D. None of the above

10. One hour of time corresponds to
A. 10° of longitude
B. 15° of longitude
C. 30° of longitude
D. 60° of longitude

Section B

Five Questions of 02 Marks each

11. State the dates of solstice and equinoxes,
12. Define Greenwich hour angle (GHA) and Local hour angle (LHA).
13. Explain in brief the "Equinoctial system" and the "Rational horizon system" of identifying the position of a heavenly body on the celestial sphere.
14. List the errors of a marine sextant.

15. Determine the Geographical Position of a celestial body from the following: GHA = 110°, LHA = 336°, Declination = 18° N.

Section C

Five Questions of 10 Marks each. All are compulsory.

16. On 5th March 2008, AM at ship in DR 38°15'S 151°12'E, the sextant altitude of the sun's LL was 35°58' when chron showed 10h55m55s. Error 00m45s slow. If IE was 1.3' off the arc and HE was 30m, find the direction of the LOP and the longitude where it cuts the DR latitude. (10 marks)

17. a) On 20th Jan 2008, in DR 52°22'N, 046°30'W, the sun set bearing 232°(C). If variation was 2°W, find the deviation of the compass. (5 marks)

b) A star when on the meridian above the pole, bore North with a true altitude of 70°04' and when on the meridian, below the pole, bore North with true altitude 22°05'. Find the observer's latitude and the declination of the star. (5 marks)

18 On 30th April 2008, in DR 00°25'S, 060°10'W, the sextant altitude of the sun's UL east of the meridian was 44°15.2' when the chronometer showed 01h00m55s. If IE was 3.1 on the arc and HE was 20M, find the intercept and the direction of the LOP. (10 marks)

19. a) On 23rd Sept 2008. In DR 23°24'N, 162°06'E the sextant meridian altitude of the sun's lower limb was 66°10.6'. If IE was 2.5' on the arc and HE was 12m find the latitude and the LOP. (6 marks)

b) Explain civil, nautical and astronomical twilight. (4 marks)

20. a) On 28th April, PM at ship in DR 40° 28'N 060°41'E, Saturn bore 236°(C) at 05h43m35s by chronometer. Chron error was 04m07s slow. Variation was 2°E. Calculate the deviation of the compass for that compass course. (5 marks)

b) Prove the following statement for an observer in the northern hemisphere with a diagram, "Latitude of the observer is equal to the altitude of the pole". (5 marks)