

**Indian Maritime University**  
**(A Central University, Govt of India)**  
**Supplementary Examinations – March/April 2025**  
**Programme Name: B Sc (NS)**  
**Semester: FOUR**  
**Subject Code: UG21T5401**  
**Subject Name: CELESTIAL NAVIGATION PAPER-II**

Date: 25.03.2025

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. Star 'Sirius' lies in ..... Constellation  
a. Orion      b. Canis Major      c. Scorpius      d. Taurus
2. Equation of time = .....  
a. RATS – RADMS      b. RADMS – RMS      c. RATS – RMS      d. RADMS - RMS
3. For a stationary observer on North Pole, Rational Horizon lies..  
a. North of Equinoctial      b. South of Equinoctial      c. At Equinoctial      d. None
4. In Azimuth calculation 'A' is named opposite to latitude when LHA lies between ..... degrees.  
a. 090 and 270      b. 000 and 180      c. 180 and 000      d. 270 and 90
5. Line joining Center of the Earth and Center of the CB pass through ..... On the surface of the Earth  
a. GP of CB      b. Ship' Position      c. Both      d. None
6. Tail end star of the constellation 'Ursa Major' is .....  
a. Dubhe      b. Merak      c. Polaris      d. None
7. Astronomical PL is

- a. Same as Azimuth of CB as in terrestrial observation      b. Perpendicular to the Azimuth      c. Same  
 d. All are correct
8. Twilight circle lies ..... degrees beyond horizon  
 a. 6deg      b. 12deg      c. 18deg      d. 24deg
9. Range of Polaris azimuth lies +/- ..... degrees from North  
 a. 1.2      b. 1.4      c. 1.6      d. 1.8
10. A Celestial body is called Circumpolar when  
 a. Co-dec of CB > Obs lat      b. Co-dec of CB = Dec of CB      c. Co-dec of CB  
 <= Obs lat      d. Co-dec of CB = PD of CB

### Section B

#### **Five Questions of 02 Marks each**

11. Show with diagram altitude of the Sun at the time of Sunrise?
12. Write down intercept formula for CZD and convert it into formula for long by chron?
13. Lat = 60deg N and Dec of Sun = 21deg N. Draw diagram to the scale and mention whether there will be night time or not?
14. Sext Alt = 28deg 11' (Star), IE = 2' off the arc, HE = 10.0m. Calculate TZD
15. GMT = 29d (Nov) 17h 47m 49s, Obs long = 130deg 30' W. Find out LHA of star 'Atria'?

### Section C

#### **Five Questions of 10 Marks each.**

**16.**

- a. Define GHA and LHA. Explain their relationship with time? (5 Marks)  
 b. Explain the difference between 'Solar Day' and 'Sidereal Day' duration? (5 Marks)

**17.**

- a. Assume observer in latitude 45deg N and explain how celestial bodies of different declination would be visible during a day. (5 Marks)  
 b. On 22<sup>nd</sup> Sept 2008 at ship in DR 30deg 30'N 90deg 30'W, the star RASALHAGUE bore 275deg (C) at 04h 30min GMT, if variation was 4deg W, find the deviation of the compass. (5 Marks)

**18.**

**a.** How will you identify Polaris in the sky using constellation method and explain relationship between observer's latitude and altitude of the Polaris? (5 Marks)

**b.** On 22<sup>nd</sup> Sept 2008, PM at ship in DR 18deg 25'N 72deg 30'E, the Pole star bore 359deg (C) at Chron time 04h 00m 00s (Error 10m slow). Sextant Alt of pole star being 18deg 45', IE = 0.0' and HE = 12.5m. If variation was 1deg E, find the deviation for the ship's head. (5 Marks)

**19.**

**a.** Explain why celestial position line is drawn perpendicular to the azimuth? (5 Marks)

**b.** With neat diagram (To the scale) show the range of declination for which a CB would be circumpolar for observer in 45deg N latitude? (5 Marks)

**20.** On 1<sup>st</sup> May 2008, in DR 00deg 00'N, 60deg 00'W, the sextant altitude of the Sun's UL East of the meridian was 44deg 10', when the GPS clock showed 01h 00m 00s. If IE was 3.0' off the arc and HE was 10m, find the direction of the LOP and the longitude where it cuts the DR latitude. (10 Marks)

