

Indian Maritime University
(A Central University, Govt. Of India)
June 2024 ESE
Programme: B.Sc (NS)
Semester -IV
UG21T5401
Celestial Navigation Paper-II

Duration-3 hrs
Date - 28.05.2024

Max. Marks-70
Pass Marks-35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) All Questions compulsory
- (iii) Norrie's Table & Nautical Almanac can be used.
- (iv) Scientific calculator (Non Programmable) can be used.

SECTION-A

Answer All questions (10 x 1mark=10marks)

1. The Constellation the pole star belongs to
 - a) ORION
 - b) URSA MINOR
 - c) CASSIOPEIA
 - d) URSA MAJOR

2. Rising Amplitude of Sun is E 09° S. What would be the True bearing of the Sun?
 - a) 089°T
 - b) 081°T
 - c) 099°T
 - d) 009°T

3. Amplitude of the sun is observed when
 - a) when the LL of sun is on the visible horizon
 - b) when the UL of sun is on the visible horizon
 - c) when the LL of sun is ½ diameter above visible horizon
 - d) when the centre of sun is on the visible horizon

4. LHA of a star at the Lower Meridian Passage of an observer would be:
 - a) 180°
 - b) 360°
 - c) 000°
 - d) 090°

5. IF GAT = 02h 30m 36s & GMT = 02h 36m 48s then EOT would be
 - a) EOT = 6m 12s (+Ve)
 - b) EOT = 6m 12s (-Ve)

- c) $1^{\circ} 33'$ (+ve)
- d) $1^{\circ} 33'$ (-ve)

6. If the Decl & MZD of Sun is $22^{\circ}30'$ N & $10^{\circ}30'$ N respectively, then Lat. of the observer & Azimuth of the Sun would be

- a) lat. = 33° N & AZ of CB = 000°
- b) lat. = 12° N & AZ of CB = 180°
- c) lat. = 12° S & AZ of CB = 000°
- d) lat. = 33° N & AZ of CB = 180°

7. In the Evening - Nautical Twilight last when

- a) Sun is between 0° - 6° vertically below ORH
- b) Sun is between 6° - 12° vertically below ORH
- c) Sun is within 18° of twilight belt
- d) Sun is between 12° - 18° vertically below ORH

8. If the Direction of LOP is 130° - 310° then the Az of the CB could be

- a) 040° only
- b) 220° only
- c) Both 040° or 220°
- d) none

9. Meridian passage time of a star is about 4m early each day because

- a) SHA of star changes 4m each day
- b) Stars are far away
- c) GHA of a star increases at a rate $< 15^{\circ}/\text{hr}$.
- d) Solar day is longer than sidereal day by about 4m.

10. Equation of time is the angle difference between

- a. Mean sun and Dynamical mean sun
- b. Mean sun and True sun
- c. True sun and Dynamical mean sun
- d. None

SECTION-B

Answer all five question (5x2mark= 10marks)

11. Calculate the sun rise time in GMT for an observer in DR $22^{\circ} 30'N$ $142^{\circ} 30'W$ on 27th APR. 2008

12. Find the Meridian Passage time (IST) for an observer in Chennai anchorage ($13^{\circ} 00'N$ $080^{\circ} 15'E$) on 26th Feb 2008.

13. SHA & Decl. of an unknown star in the Month of Dec. 2008 was $153^{\circ} 01.7'$ & $49^{\circ} 15.8'N$ respectively. Identify the star; also find No, Constellation Name, & stellar magnitude.

14. Define LHA and LST?

15. Explain why True sun is not suitable for Time keeping?

SECTION-C

Answer all questions (5x10marks=50marks)

16. Jan. 20th 2008, in DR $54^{\circ} 20' S / 46^{\circ} 26' W$, the Sun set bearing $230^{\circ}(C)$. If variation was $3^{\circ}W$, find deviation of the compass.

17. On 19th Jan. 2008, at GMT 03h 48m 00s at ship in DR $40^{\circ} 00' S 175^{\circ} 30' E$, the sextant altitude of the Sun's LL was $43^{\circ} 27.4'$. If HE = 22 m, and IE = $1.5'$ on the arc find the Intercept and the direction of LOP

18. In the evening of 30th Nov. 2008, a ship in DR Long. $160^{\circ} 30' E$, found the sextant altitude of the Polaris to be $36^{\circ} 30'$ at 05h 21m 08sec GMT. If IE was $2.8'$ on the arc and HE was 10m, find the direction of the LOP and the Latitude where it cuts the DR. Long. If at that time Polaris bore $358^{\circ}(G)$, find the Gyro Error & state it was High or Low.

19. On 2nd May 2008, in DR $15^{\circ} 36' S 080^{\circ} 11' W$, the sext. Alt. of Sun's LL near the Meridian Was $58^{\circ} 22.6'$ when the GMT time was 17h 37m 48s. If IE was $1.6'$ on the arc and HE Was 15m, find the direction of the LOP and the latitude where it cuts the DR long.

20.

a) Show by a diagram that for an observer in North pole the Upper & Lower meridian Altitude of a star would be equal to the declination of the star. (5 marks)

b) Given Latitude as $32^{\circ} 11' N$ & declination of a star as $69^{\circ} 36' N$, draw an appropriate sketch and compute the Upper & Lower meridian altitude of the star?

(5 marks)
