UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 3 Examination in Engineering: June 2015

Module Number: IS3231   **Module Name: Introduction to Astronomy**

[Two Hours]

[Answer all questions]

Q1 a) Define the following terms used in Astronomy
   - i)   Arctic circle
   - ii) Local meridian
   - iii) Temperate zone   [2 marks]

   b) What is the shortest distance between Katunayake, Sri Lanka (Lat 7.1729^0 N, Lon 79.8849^0 E) and Lima, Peru (Lat 12.0433^0 S, Lon. 77.0283^0 W).   [2 marks]

   c) If an aircraft is to fly from Katunayake airport in Sri Lanka to Lima, Peru, what heading should the pilot follow?

   [3 marks]

Q2 a) An observer is standing at a location in the Northern Hemisphere on Earth where the Latitude is λ. She is trying to locate a star whose declination is δ. What are the conditions under which this star
   - i) is circumpolar
   - ii) is never visible from her location
   - iii) will rise exactly due East and set exactly due West   [2 Marks]

   b) The first column of the table Q1 gives a list of five stars and their declinations. The first row gives a list of five cities and their latitudes. For each city classify each star as circumpolar, visible or not visible

Table Q1: Declinations of stars and latitudes of cities

	Lima $\lambda = 12.0$ S	Hapugala $\lambda = 6.1$ N	Brasilia $\lambda = 15.8$ S	Manila $\lambda = 14.6$ N	Moscow $\lambda = 55.8$ N
Canopus $\delta = -52.7$					
Rigel $\delta = -8.2$					
Spica $\delta = -11.2$					
Deneb $\delta = +45.3$					
Alioth $\delta = +56.0$					

[5 Marks]

Q3. a) A student made the following observations on a star..

Azimuth 30.2^0

Altitude 40.1^0

Latitude of the location 6.1^0N

What is the declination of the star?

[2 Marks]

b) Following observations were made from a ship on two stars .

Star	A	B
Declination	23.2^0	44.2^0
Azimuth	100.9^0	32.2^0
Zenith Distance	52.5^0	66.6^0

What is the latitude of the current position of the ship.?

[4 Marks]

Formula Sheet

$Cos(a) = Cos(b) \times Cos(c) + Sin(b) \times Sin(c) \times Cos(A)$

$Cos(b) = Cos(a) \times Cos(c) + Sin(a) \times Sin(c) \times Cos(B)$

$Cos(c) = Cos(b) \times Cos(a) + Sin(b) \times Sin(a) \times Cos(C)$

$Sin(a) / Sin(A) = Sin(b) / Sin(B) = Sin(c) / Sin(C)$

$Sin(\delta) = Sin(\lambda)Cos(z) - Cos(\lambda)Sin(z)Cos(\alpha)$

$Cos(\lambda) = -P / Q$

$P = Sin(\delta_1)Cos(z_2) - Sin(\delta_2)Cos(z_1)$

$Q = Cos(z_1)Sin(z_2)Cos(\alpha_2) - Sin(z_1)Cos(z_2)Cos(\alpha_1)$

Radius of Earth = 6371 km