



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 3 Examination in Engineering: July 2016

Module Number: IS3207

Module Name: Introduction to Astronomy

[Three Hours]

[Answer ALL questions, each question carries 12 marks]

Q1 a) Define following terms.

- i) International date line
- ii) Co-Latitude

[2 Marks]

b) You are in Bangkok airport and need to go to Galle as early as possible. There is a Singapore airline flight to Katunayake, and a Sri Lankan airline flight to Mattala. You have two options to go to Galle. One, to go to Katunayake and take a taxi to Galle, or go to Mattala and take a taxi to Galle. Based on the information given below evaluate the best option.

Departure time of Singapore Airline flight	: 09:00 hrs
Departure time of Sri Lankan airline flight	: 10:00 hrs
Time taken to go to Galle from Katunayake	: 3 hrs
Time taken to go to Galle from Mattala	: 4 hrs

Mattala (coordinates)	: 6.1238° N,	81.12053° E
Bangkok (coordinates)	: 13.7279° N,	100.5241° E
Katunayake(coordinates)	: 7.1729° N,	79.8849° E

Radius of Earth	: 6371 km
Average speed of the Singapore airline aircraft	: 800 km/hr
Average speed of the Sri Lankan airlines aircraft	: 750 km/hr
(you can assume that custom and immigration delays are the same at both Katunayake and Mattala)	

[10 Marks]

Q2 a) Explain the following terms

- i) Local Mean time
- ii) Local standard time
- iii) Sidereal time

[3 Marks]

A star observation class is planned for 10th Apr 2016, at the Hapugala Faculty premises, where you are required to check the accuracy of your watch by observing the time when a star crosses the local meridian. Which of the following three stars is suitable for this observation. Local Sidereal Time at noon on 01st April 2016, at Hapugala is 5h 01m. (Answers without supporting calculations will carry no marks)

Star	RA	Declination (Deg)
Arcturus	14h 15m	19.2
Sirius	6h 45m	-16.7
Regulus	10h 8m	22.0

[9 Marks]

- Q3 a) Calculate the difference between the Sunrise position on the two Solstice days for Colombo (Latitude 6.9^o N)

[4 Marks]

Following observations were made from a ship on two stars .

b)

Star	Alpha Centauri	Vega
Declination	-60.5 ^o	38.5 ^o
Azimuth	171.5 ^o	45.0 ^o
Zenith Distance	71.5 ^o	54.4 ^o

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

[8 marks]

Q4. Write short notes on the following

- Predictive aspect of Vedic Astrology
- Black holes
- Apparent and absolute magnitude of stars
- Identification of leap years in Gregorian calendar

[3 Marks each]

- Q5 a) Figure Q5 shows the Vedic style horoscope of Michael Jackson who was born in Gary, Indiana.

- Convert the horoscope to a Sri Lankan type
- Find out his birth Nekath

[5 marks]

- b) Find out the Maha Dasa and Anthar dasa

- At his time of birth
- On his 30th birthday
- On his 50th birthday

(Use the Nekath Chart attached)

[7 marks]

Michael Jackson Aug 29,1958
 Time: 7:54AM Zone: 10:00 DST: 1
 Gary, Indiana
 Longitude: 86W08 Latitude: 40N16 CurPer: Ke/Ma/Me
 Lahiri Ayanamsa: 23:17 365.25 Day Year

Ke 29:51	Ma 28:38		
Mo 17:44			Ve 23:24
			MeR 2:17 Su 12:34
	Sa 25:51	Ju 5:12 As 20:01	Ra 29:51

Figure Q5: Vedic style horoscope

Formula Sheet

$$\cos(a) = \cos(b) \times \cos(c) + \sin(b) \times \sin(c) \times \cos(A)$$

$$\cos(b) = \cos(a) \times \cos(c) + \sin(a) \times \sin(c) \times \cos(B)$$

$$\cos(c) = \cos(b) \times \cos(a) + \sin(b) \times \sin(a) \times \cos(C)$$

$$\sin(a) / \sin(A) = \sin(b) / \sin(B) = \sin(c) / \sin(C)$$

$$\sin(\delta) = \sin(\lambda)\cos(z) - \cos(\lambda)\sin(z)\cos(\alpha)$$

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

$$P = \sin(\delta_1)\cos(z_2) - \sin(\delta_2)\cos(z_1)$$

$$Q = \cos(z_1)\sin(z_2)\cos(\alpha_2) - \sin(z_1)\cos(z_2)\cos(\alpha_1)$$

$$\cos(\alpha) = \sin(\delta) / \cos(\lambda)$$

Radius of Earth = 6371 km

Declination of Sun on 21st June = 23.5 N

Declination of Sun on 21st December = 23.5 S

Nekath Chart

Nekath	Pada	Lagna	Maha Dasa				Navamsa		
			from	to	Lord	Years	from	to	
Aswini 1	1	1 Mesha	0	3d 20m	Kethu	7	0	3d 20m	Aries
		2 Aries	3d 20m	6d 40m			3d 20m	6d 40m	Taurus
		3	6d 40m	10d 0m			6d 40m	10d 0m	Gemini
		4	10d 0m	13d 20m			10d 0m	13d 20m	Cancer.
Bharani 2	2	1	0	3d 20m	Venus	20	13d 20m	16d 40m	Leo
		2	3d 20m	6d 40m			16d 40m	20d 0m	Virgo
		3	6d 40m	10d 0m			20d 0m	23d 20m	Libra
		4	10d 0m	13d 20m			23d 20m	26d 40m	Scorpio
Krittika 3	3	1	0	3d 20m	Sun	6	26d 40m	30d 0m	Sagittarius
		2 Wrushabha	3d 20m	6d 40m			0	3d 20m	Capricorn
		3 Taurus	6d 40m	10d 0m			3d 20m	6d 40m	Aquarius
		4	10d 0m	13d 20m			6d 40m	10d 0m	Pisces
Rohini 4	4	1	0	3d 20m	Moon	10	10d 0m	13d 20m	Aries
		2	3d 20m	6d 40m			13d 20m	16d 40m	Taurus
		3	6d 40m	10d 0m			16d 40m	20d 0m	Gemini
		4	10d 0m	13d 20m			20d 0m	23d 20m	Cancer.
Mrigshira 5	5	1	0	3d 20m	Mars	7	23d 20m	26d 40m	Leo
		2	3d 20m	6d 40m			26d 40m	30d 0m	Virgo
		3 Mituna	6d 40m	10d 0m			0	3d 20m	Libra
		4 Gemini	10d 0m	13d 20m			3d 20m	6d 40m	Scorpio
Aridra 6	6	1	0	3d 20m	Rahu	18	6d 40m	10d 0m	Sagittarius
		2	3d 20m	6d 40m			10d 0m	13d 20m	Capricorn
		3	6d 40m	10d 0m			13d 20m	16d 40m	Aquarius
		4	10d 0m	13d 20m			16d 40m	20d 0m	Pisces
Punarvasu 7	7	1	0	3d 20m	Jupiter	16	20d 0m	23d 20m	Aries
		2	3d 20m	6d 40m			23d 20m	26d 40m	Taurus
		3	6d 40m	10d 0m			26d 40m	30d 0m	Gemini
		4 Kartaka	10d 0m	13d 20m			0	3d 20m	Cancer.
Pushya 8	8	1 Cancer.	0	3d 20m	Saturn	19	3d 20m	6d 40m	Leo
		2	3d 20m	6d 40m			6d 40m	10d 0m	Virgo
		3	6d 40m	10d 0m			10d 0m	13d 20m	Libra
		4	10d 0m	13d 20m			13d 20m	16d 40m	Scorpio
Ashlesha 9	9	1	0	3d 20m	Mercury	17	16d 40m	20d 0m	Sagittarius
		2	3d 20m	6d 40m			20d 0m	23d 20m	Capricorn
		3	6d 40m	10d 0m			23d 20m	26d 40m	Aquarius
		4	10d 0m	13d 20m			26d 40m	30d 0m	Pisces
Magha 10	10	1 Simha	0	3d 20m	Kethu	7	0	3d 20m	Aries
		2 Leo	3d 20m	6d 40m			3d 20m	6d 40m	Taurus
		3	6d 40m	10d 0m			6d 40m	10d 0m	Gemini
		4	10d 0m	13d 20m			10d 0m	13d 20m	Cancer.
Purva Phalguni 11	11	1	0	3d 20m	Venus	20	13d 20m	16d 40m	Leo
		2	3d 20m	6d 40m			16d 40m	20d 0m	Virgo
		3	6d 40m	10d 0m			20d 0m	23d 20m	Libra
		4	10d 0m	13d 20m			23d 20m	26d 40m	Scorpio
Uttra Phalguni 12	12	1	0	3d 20m	Sun	6	26d 40m	30d 0m	Sagittarius
		2 Kanni	3d 20m	6d 40m			0	3d 20m	Capricorn
		3 Virgo	6d 40m	10d 0m			3d 20m	6d 40m	Aquarius
		4	10d 0m	13d 20m			6d 40m	10d 0m	Pisces
Hasta 13	13	1	0	3d 20m	Moon	10	10d 0m	13d 20m	Aries
		2	3d 20m	6d 40m			13d 20m	16d 40m	Taurus
		3	6d 40m	10d 0m			16d 40m	20d 0m	Gemini
		4	10d 0m	13d 20m			20d 0m	23d 20m	Cancer.
Chitra	1		0	3d 20m	Mars	7	23d 20m	26d 40m	Leo

14	2		3d 20m	6d 40m			26d 40m	30d 0m	Virgo
	3	Thula	6d 40m	10d 0m			0	3d 20m	Libra
	4	Libra	10d 0m	13d 20m			3d 20m	6d 40m	Scorpio
Swati	1		0	3d 20m	Rahu	18	6d 40m	10d 0m	Sagittarius
15	2		3d 20m	6d 40m			10d 0m	13d 20m	Capricorn
	3		6d 40m	10d 0m			13d 20m	16d 40m	Aquarius
	4		10d 0m	13d 20m			16d 40m	20d 0m	Pisces
Vishaka	1		0	3d 20m	Jupiter	16	20d 0m	23d 20m	Aries
16	2		3d 20m	6d 40m			23d 20m	26d 40m	Taurus
	3		6d 40m	10d 0m			26d 40m	30d 0m	Gemini
	4	Wrushchika	10d 0m	13d 20m			0	3d 20m	Cancer.
Anuradha	1	Scorpio	0	3d 20m	Saturn	19	3d 20m	6d 40m	Leo
17	2		3d 20m	6d 40m			6d 40m	10d 0m	Virgo
	3		6d 40m	10d 0m			10d 0m	13d 20m	Libra
	4		10d 0m	13d 20m			13d 20m	16d 40m	Scorpio
Jyeshtha	1		0	3d 20m	Mercury	17	16d 40m	20d 0m	Sagittarius
18	2		3d 20m	6d 40m			20d 0m	23d 20m	Capricorn
	3		6d 40m	10d 0m			23d 20m	26d 40m	Aquarius
	4		10d 0m	13d 20m			26d 40m	30d 0m	Pisces
Moola	1	Dhanu	0	3d 20m	Kethu	7	0	3d 20m	Aries
19	2	Sagittarius	3d 20m	6d 40m			3d 20m	6d 40m	Taurus
	3		6d 40m	10d 0m			6d 40m	10d 0m	Gemini
	4		10d 0m	13d 20m			10d 0m	13d 20m	Cancer.
Purwa	1		0	3d 20m	Venus	20	13d 20m	16d 40m	Leo
Asadha	2		3d 20m	6d 40m			16d 40m	20d 0m	Virgo
20	3		6d 40m	10d 0m			20d 0m	23d 20m	Libra
	4		10d 0m	13d 20m			23d 20m	26d 40m	Scorpio
Uttar	1		0	3d 20m	Sun	6	26d 40m	30d 0m	Sagittarius
Asadha	2	Makara	3d 20m	6d 40m			0	3d 20m	Capricorn
21	3	Capricorn	6d 40m	10d 0m			3d 20m	6d 40m	Aquarius
	4		10d 0m	13d 20m			6d 40m	10d 0m	Pisces
Shrawana	1		0	3d 20m	Moon	10	10d 0m	13d 20m	Aries
22	2		3d 20m	6d 40m			13d 20m	16d 40m	Taurus
	3		6d 40m	10d 0m			16d 40m	20d 0m	Gemini
	4		10d 0m	13d 20m			20d 0m	23d 20m	Cancer.
Dhanista	1		0	3d 20m	Mars	7	23d 20m	26d 40m	Leo
23	2		3d 20m	6d 40m			26d 40m	30d 0m	Virgo
	3	Kumbha	6d 40m	10d 0m			0	3d 20m	Libra
	4	Aquarius	10d 0m	13d 20m			3d 20m	6d 40m	Scorpio
Satabhisha	1		0	3d 20m	Rahu	18	6d 40m	10d 0m	Sagittarius
24	2		3d 20m	6d 40m			10d 0m	13d 20m	Capricorn
	3		6d 40m	10d 0m			13d 20m	16d 40m	Aquarius
	4		10d 0m	13d 20m			16d 40m	20d 0m	Pisces
Purva	1		0	3d 20m	Jupiter	16	20d 0m	23d 20m	Aries
Bhadrapad	2		3d 20m	6d 40m			23d 20m	26d 40m	Taurus
25	3		6d 40m	10d 0m			26d 40m	30d 0m	Gemini
	4	Meena	10d 0m	13d 20m			0	3d 20m	Cancer.
Uttar	1	Pisces	0	3d 20m	Saturn	19	3d 20m	6d 40m	Leo
Asadha	2		3d 20m	6d 40m			6d 40m	10d 0m	Virgo
26	3		6d 40m	10d 0m			10d 0m	13d 20m	Libra
	4		10d 0m	13d 20m			13d 20m	16d 40m	Scorpio
Revati	1		0	3d 20m	Mercury	17	16d 40m	20d 0m	Sagittarius
27	2		3d 20m	6d 40m			20d 0m	23d 20m	Capricorn
	3		6d 40m	10d 0m			23d 20m	26d 40m	Aquarius
	4		10d 0m	13d 20m			26d 40m	30d 0m	Pisces