RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General)Degree in Applied Sciences
First Year - Semester II Examination – October/November 2017

MAA 1104 – MATHEMATICAL MODELLING

Time: One (1) hour

Answer **all** questions.

1.

a) Suppose aninvestor deposit Rs. P in an account that pays 10% annual interest. If he could withdraw Rs. 1000 from the account at the end of each year, find the model that gives his account balance after $t$years.
If the investor ensures that he can withdraw Rs. 1000 each year for the next 15 years, maintaining a non-negative balance. Show that

$$P \geq 10000 \left[1 - \frac{1}{(1.1)^{15}}\right]$$

(60 marks)

b) The hypotenuse of a triangle is $5\sqrt{2}$ times the length of its shorter leg. Find a function that models the area of the right triangle in terms of the length of the shorter leg.
If the shorter leg is 10 centimeters long, what is the area of the triangle?

(40 marks)

2.

a) Let $x(t)$ be the population size of a country at time $t$and let $b$be the birth rate and $d$be the death rate. Show that,

$$x(t) = x(0).e^{(b-d)t}$$

The country population since 1960 has been growing at the rate of 5% per year. Further, records indicate that the country population in 1990 was 2 million. Find the population of country in the year 2020 and when will be the country population be 10 million?

(50 marks)

b) ABC Electronics (Pvt) Ltd produces and sales USB flash drives. The cost function is given by $C(x) = 5x + 10\sqrt{x} + 20$, where x is the number of flash drives and selling price of a flash drive is \$10.

Find, total revenue for 100 flash drives, the approximate cost of producing the 101^{st} of flash drive and average cost per flash drive for first 25 flash drives.

[Assume: $e^{1.5} \approx 4.5$and $\ln(5) \approx 1.6$]

(50 marks)

END