SOUTH EASTERN UNIVERSITY OF SRI LANKA

FIRST EXAMINATION IN BACHELOR OF INFORMATION AND COMMUNICATION TECHNOLOGY 2015/2016

SEMESTER – I, JULY 2017

CMS 11013 - MATHEMATICS FOR ICT

Answer all Questions **Time: 03 Hours**

Question No 01

a) In a competition, a school awarded medals in different categories. 36 medals in dance, 12 medals in dramatic and 18 medals in music. If these medals went to a total of 45 persons and only 4 persons got medals in all three categories, how many received medals in exactly two of these categories.

(25 Marks)

b) Prove the following functions using the algebra laws.

i. $B'-(B'- A)= B' \cap A$
ii. $[(B-A)' \cap A]- A'= A$

(25 Marks)

c) In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women?

(25 Marks)

d) In how many different ways can the letters of the word 'MATHEMATICS' be arranged such that the vowels must always come together?

(25Marks)

[100 Marks]

Question No 02

a) The output of a logic circuit is 1, only whenever any one of the following patterns is present, such three inputs are like: 000, 001, 010, 011, and 110.

i. Draw the truth table of the output function.

ii. Obtain the **minimal** 'Boolean' expression.

iii. Develop a logic circuit to generate the output signal.

(50 Marks)

b) Consider the following propositional variables

P: It is sunny

Q: It is windy

R: It is showering

Represent the following terms using symbols.

i. It is hot and windy

ii. It is showering and it is not sunny

iii. It is neither sunny nor windy

iv. If it is windy, then it is sunny

v. If it is sunny and windy, then it is showering

vi. If and only if it is windy and not sunny, it is showering.

(30 Marks)

c) Validate the equivalency of the proposition $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ using truth tables.

(20 Marks)

[100 Marks]

Question No 03

a) Gary and Henry brought an equal amount of money for shopping. Gary spent \$95 and Henry spent \$350. After that, Henry had 4/7 of what Gary had left. How much money does Gary have now, after shopping?

(25 Marks)

b) 1000 tickets were sold. Adult tickets cost \$8.50, children's cost \$4.50, and a total of \$7300 was collected. How many tickets of each kind were sold?

(25 Marks)

c) Simplify the following expressions and give the answers with rational denominators.

i. $\frac{4}{\sqrt{3}+\sqrt{7}} + \frac{5}{\sqrt{3}+2\sqrt{7}}$

ii. $\frac{3}{\sqrt{2}+\sqrt{5}} - \frac{1}{\sqrt{2}-1}$

(20 Marks)

d) Find the perimeter of a rectangle, having the length and width $(\sqrt{2}+2\sqrt{3})$ and $(\sqrt{3}+2\sqrt{7})$ respectively.

(10 Marks)

e) Solve the following

i. $[1/6]^{-3x-2} = 36^{x+1}$

ii. $9 \times 3^{x+1} = 1/27$

(20 Marks)

[100 Marks]

Question No 4)

Answer the questions below based on the following frequency table of the distribution of gas consumption of a house in 100 days.

Gas Consumption (In Units)	Frequency (f)
10 – 19	1
20 – 29	0
30 – 39	1
50 – 59	7
60 – 69	16
70 – 79	19
80 – 89	20
90 – 99	17
100 – 109	11
110 – 119	3

a) Find the mean of the distribution?

(25 Marks)

b) Calculate the standard deviation and variance of the distribution?

(25 Marks)

c) What is the median of the distribution?

(10 Marks)

d) Find the quartiles (Q1, Q2 and Q3) and calculate the interquartile range of the distribution.

(40 Marks)

[100 Marks]

Question No 05

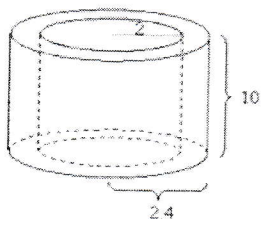
a) The angle of elevation of a hot air balloon, climbing vertically, changes from 25 degrees at 10:00 AM to 60 degrees at 10:02 AM. The point of observation of the angle of elevation is situated 300 meters away from the take-off point. What is the upward speed and assumed constant, of the balloon? Give the answer in meters per second and round to two decimal places.

(25 Marks)

b) A hemisphere bowl made of brass has inner diameter 10.5 cm. Find the cost of tin plating it on the inside at the rate of Rs 16.00 per $100cm^2$.

(25 Marks)

c) The figure shows a section of a metal pipe. Given the internal radius of the pipe is 2 cm, the external radius is 2.4 cm and the length of the pipe is 10 cm. Find the total surface area of the pipe.



(25 Marks)

d) Prove the following trigonometric functions.

i. $1 - 2\,cos^2 x = \frac{tan^2 x - 1}{tan^2 x + 1}$

ii. $\cot x + tanx = \sec x\, cosec\, x$

(25 Marks)

[100 Marks]

Question No 06

a) Differentiate with respect to x

i. $y = \frac{(x+2)(3x-1)}{x^2}$

ii. $y = x^3 \sin x$

(25 Marks)

b) Differentiate $y = ax^2 + bx + c$ from first principles. This curve passes thorugh the point (0, 1) and the gradient of the curve at the point (-1/4, 7/8) is zero. Find the values of *a, b* and *c*.

(25 Marks)

c) Calculate the following integrals.

i. $\int (x^2 + x - 1)\, dx$

ii. $\int sin^2 \left(\frac{x}{2}\right) dx$

(25 Marks)

d) Find the area bound by the curve $x^3 - 1$, the x axis, and the lines x=0 and x=3.

(25 Marks)

[100 Marks]