TECHNICAL UNIVERSITY OF MOMBASA

INSTITUTE OF COMPUTING AND INFORMATICS

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY

AMA2130: COMPUTATIONAL MATHEMATICS

END OF SEMESTER EXAMINATION

SERIES:AUGUST2017

TIME:2HOURS

DATE: Pick DateSep2017

Instructions to Candidates

You should have the following for this examination

-*Answer Booklet, examination pass and student ID*

This paper consists of **FIVE** questions. Attemptany THREE questions.

Do not write on the question paper.

Question ONE

a) Explain the following terms using examples

i. Set
ii. Set membership
iii. Subset
iv. Cardinality (8 marks)

b) Answer the following True or False.

(i) {1,2,3} is a subset of {3,2,1,4}.

(ii) {3,2,1,4} is a subset of {1,2,3}. (2 marks)

c). Let U ={1,2,3,4,5,6,7,8,9,10} and A ={1,3,5,7,9} and B ={1,4,5,9}.

(i) Find $A \cup B$ (1 mark)

(ii) Find A∩B (1 mark)

(iii) Use a Venn diagram to represent these sets. (2marks)

d) Ninety people at a Super bowl party were surveyed to see what they ate while watching the game. The following data was collected: 48 had nachos. 39 had wings. 35 had a potato skins. 20 had both wings and potato skins. 19 had both potato skins and nachos. 22 had both wings and nachos. 10 had nachos, wings and potato skins.

(i) Use a Venn diagram to represent this data. (4 marks)

(ii) How many had nothing? (2 marks)

Question TWO

a)Determine the values of A, B, C, and D that make the sum term $A + \overline{B} + C + \overline{D}$ equal to 0. (2marks)

b) Proof that $A + \overline{A}B = A + B$

i. using Boolean basic laws
ii. using truth table
iii. draw the circuit diagram to represent above expression (12 marks)

c)

i. Apply DeMorgan's theorems to the expressions $\overline{XYZ}$ and $\overline{X + Y + z}$. (2marks)
ii. Convert the following Boolean expression into standard POS form:
(A + B + C)(B + C + D)(A + B + C + D) (4marks)

Question THREE

a) (i)Explain the meaning of radix or base of a number system (2 marks)
(ii) Briefly describe why hex representation is used for the addresses and the contents of the memory locations in the main memory of a computer. (2marks)

b) Give the next three numbers in each of the following hex sequences:
(i) 4D5, 4D6, 4D7, 4D8, _ _ _ ;
(ii) C998, C999, _ _ _ (3 marks)

c)

i) Find the binary equivalent of $(374.26)_8$ and the octal equivalent of $(1110100.0100111)_2$ (4marks)

ii) Find the binary equivalent of $(17E.F6)_{16}$ and the hex equivalent of $(1011001110.011011101)_2$.(4marks)

d)
i. Differentiate between 1's and 2's complement (1marks)

ii. Find the decimal equivalent of the following binary numbers expressed in the 2's complement format: 00001110 , 10001110. (4marks)

Question FOUR

a)

i. Determine how many bits would be required to encode decimal numbers 0 to 9999 in straight binary and BCDcodes?

ii. Show the BCD equivalent of decimal 27 in 16-bit representation (4marks)

b)Find

(i) the excess-3 equivalent of (237.75)10

(ii) the decimal equivalent of the excess-3 number 110010100011.01110101. (4 marks)

c)

i. Explain what is the Gray code (2 marks)

ii. State four applications of the Gray code. (4marks)

iii. Determine the Gray code equivalent of (10011)2 and the binary equivalent of the Gray code number 110011. (4marks)

d)

State salient features of the ASCII and EBCDIC codes in terms of their capability to represent characters and suitability for their use in different platforms. (2marks)

Question FIVE

a) Find the only input combination that:

(i) Will produce a logic '1' at the output of an eight-input AND gate?

(ii) Will produce a logic '0' at the output of a four-input NAND gate?

(iii) Will produce a logic '1' at the output of an eight-input NOR gate?

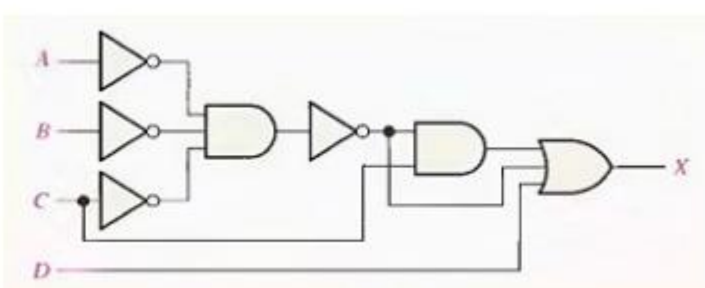
(iv) Will produce a logic '0' at the output of a four-input OR gate? (4marks)

b)Draw logic implementation of THREE basic gates

i)Using NAND gate only

ii)Using nor gate only (8 marks)

c) Reduce the combinational logic circuit in Figure shown below to a minimum form.



(8 marks)