UNIVERSITY OF GHANA

FIRST SEMESTER UNIVERSITY EXAMINATIONS: 2017/2018

DEPARTMENT OF COMPUTER SCIENCE

CSIT 307: DIGITAL AND LOGIC SYSTEMS (3 CREDITS)

EXAMINER: FERDINAND KATSRIKU (PHD)

TIME ALLOWED: 2 HOURS

ANSWER ALL QUESTIONS - [35 MARKS]

MULTIPLE CHOICE QUESTIONS

1. Any number with an exponent of zero is equal to:

A. zero

B. One

C. that number

D. ten

2. In the decimal numbering system, what is the MSD?

A. The middle digit of a stream of numbers

B. The digit to the right of the decimal point

C. The last digit on the right

D. The digit with the most weight

3. Which of the following statements does NOT describe an advantage of digital technology?

A. The values may vary over a continuous range.

B. The circuits are less affected by noise.

C. The operation can be programmed.

D. Information storage is easy.

4. What is a digital-to-analog converter?

5. What are the symbols used to represent digits in the binary number system?

6. The output of an AND gate is LOW _____.

7. The output of a NOT gate is HIGH when _____.

8. The output of an OR gate is LOW when _____.

9. Digital representations of numerical values of quantities may BEST be described as having characteristics:

10. The parallel transmission of digital data:

11. Which format requires fewer conductors?

12. A pulse has a period of 15 ms. What is the frequency of the pulse?

13. The rise time is the time it takes a pulse to go from _____.

14. What is an analog-to-digital converter?

15. What is the decimal value of 2^3 ?

16. How many binary bits are necessary to represent 748 different numbers?

17. Any number with an exponent of one is equal to:

18. Serial format means digital signals are:

19. What is the decimal value of 2^{-1} ?

20. Which format can send several bits of information faster?

21. The voltage levels used to represent binary values (0 and 1) in a digital system are nearly equal in value.

22. In a serial data system, the data is transmitted along a group of conductors simultaneously.

23. Temperature variation is normally an analog quantity.

24. A digital quantity has a discrete set of values.

25. Greater accuracy and precision are possible with digital techniques.

26. With an OR gate, the output is HIGH only when both inputs are HIGH.

A. True

B. False

27. The time interval on the leading edge of a pulse between 10% and 90% of the amplitude is the rise time.

28. Telecommunications systems do not use digital techniques.

29. The real world is mainly analog.

30. Binary means having two states or values.

31. Digital devices use only binary number system that consists of 0 and 1. What is the base of the binary numbers?

A. 1.5

B. 2

C. 1

D. 3

31. Convert (11100110) base two to decimal base.

A. 230

B. 240

C. 150

D. 130

31. Convert (0.625) base 10 to binary base.

A. 0.102

B. 0.110

C. 0.101

D. 0.111

31. Convert (13) base ten to a binary number.

A. 1110

B. 1101

C. 1011

D. 1111

31. Digital devices uses only binary number system that consist of

A. 1’ s and 2’ s

B. 0’ s and 1’ s

C. Only 0’ s

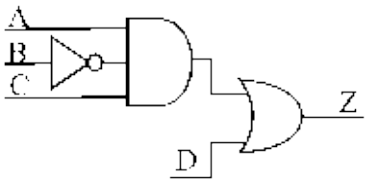
D. Only 1’ s

SECTION B ANSWER ANY THREE QUESTIONS IN THIS SECTION

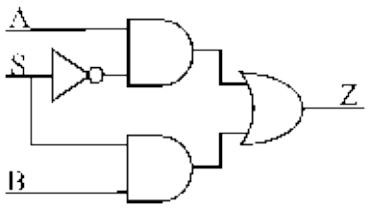
B1.

a. For each of the following logic diagrams, write the Boolean logic equation directly from the diagram and obtain the complete truth table:

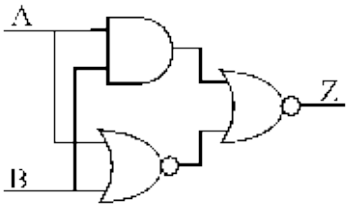
i



ii



iii



12 marks

a. For each of the following logic equations, draw the complete logic diagram directly from the logic equation and obtain the complete truth table:

Z = ABC' + AB'C + A'BC + ABC

A = ((X Y)' + Z')' (Y' + X' Z)' 8 marks

B2

a. With the aid of a suitable diagram explain the difference between a sequential circuit and a combinational circuit. 5 marks

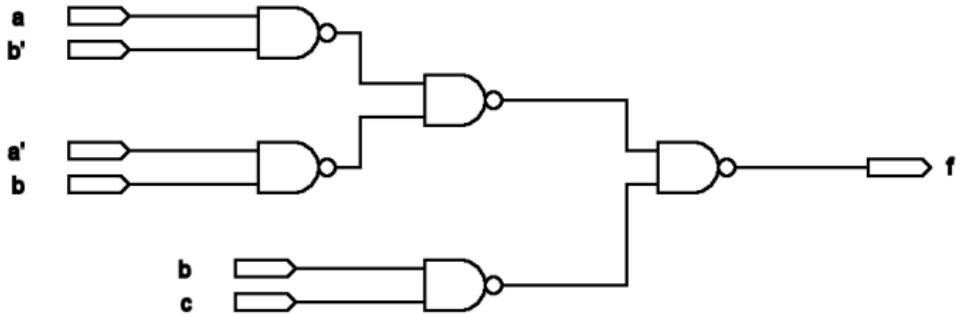
b. What is a Finite State Machine (FSM)? 3 marks

c. Describe the steps involved in the design of Finite state machines 6 marks

d. Distinguish between a Mealy machine and Moore Machine 6 marks

B3

a) Write down the output function for the circuit shown below 8 marks



a) Draw the minimum cost AND-OR implementation for *f*. Input variables are available in true and complement forms.

6 marks

a) Design a logic circuit with three inputs A, B, C and one output F such that F=1 only when a majority of the inputs is equal to 1. 6 marks

B4

The main stairway in a block of flats has three switches for controlling the lights. Switch A is positioned at the bottom of the stairs, switch B is located halfway up the stairs and switch C is located at the top of the stairs. Design a logic network to control the lights on the staircase.

20 marks