

BANGABASI COLLEGE
TEST EXAMINATION, 2015
B.SC (HONOURS) 1ST YEAR
SUBJECT: COMPUTER SCIENCE (PAPER I)

Full Marks: 100

Times: 4 Hrs

Answer Question No.1 and any five questions from rest taking at least one question from each group.

1. Answer any *ten* questions from the following: 2×10=20
- What are universal gates?
 - Using Boolean algebra techniques, simplify the following expression:
 $AB'C + A'B + (A' + B')C$
 - What is race condition?
 - Distinguish between decoder and de multiplexer.
 - What is a weighted code?
 - What is ASCII?
 - What is a tri-state buffer?
 - Differentiate between EPROM and EEPROM?
 - What is stored memory architecture?
 - $(5234)_8 = (?)_{10}$
 - Subtract: $1101_2 - 1001_2$ using 2's complement method.
 - Distinguish between Zener breakdown and Avalanche breakdown.
 - Can the barrier potential of a junction diode be measured by a voltmeter?-Explain
 - What are the differences between p-type semiconductor and n-type semiconductor?
 - What is an assembler?

GROUP-A
(COMPUTER FUNDAMENTALS)

2. a) State De Morgan's laws and prove them using truth tables.
b) What are the advantages of having floating point arithmetic with un-normalized form?
c) Develop the logic circuit for adding two decimal digits express in excess-3 code.
d) Compare and contrast at least three bus structures.
- 4 + 4 + 4 + 4 = 16
3. a) What do you understand by system software and application software?
b) What is translator? Give two example of translator.
c) Discuss about the evolution of computer system since 1940s.
- 3 + 3 + 10 = 16
4. a) Reduce the SOP expression $F(A, B, C, D) = \sum m(0, 1, 2, 3, 6, 7, 8, 11, 13, 15)$ using Boolean Algebra postulates.
b) Repeat 4(a) by K-map method.
c) Implement the result of 4(a) using only NOR gates.
d) Implement the result using NAND gates.
- 4 + 4 + 4 + 4 = 16

GROUP-B
(INTRODUCTION TO BASIC ELECTRONICS)

5. a) Draw the Bridge rectifier and explain the function .
b) Draw and explain Schmitt Trigger circuit using Op Amp.
c) Obtain the relationship between α and β parameter of transistor.
d) State and explain the Norton's theorem.

$$(2+4) + 4 + 2 + (2 + 2) = 16$$

6. a) What is forbidden gap? What happens to this gap for P-N junction under reverse bias condition?
b) Why filter is used in rectification?
c) For a half-wave and full-wave rectifier, calculate
i) Form factor
ii) Ripple factor
iii) Efficiency of rectification
iv) PIV
d) What are the main differences between the Enhancement MOSFET and Depletion MOSFET?

$$3 + 2 + (4 \times 2) + 3 = 16$$

GROUP-C
(DIGITAL SYSTEM DESIGN)

7. a) Implement the following Boolean function F, together with the don't-care conditions d:
 $F(A, B, C, D) = \sum(0, 1, 4, 5, 6, 10, 12)$
 $d(A, B, C, D) = \sum(0, 8, 9, 13, 14)$
Assume that both the normal and complement inputs are available.
b) A combinational circuit is specified by the following three Boolean functions
 $F_1(A, B, C) = \sum(3, 5, 6)$
 $F_2(A, B, C) = \sum(1, 4)$
 $F_3(A, B, C) = \sum(2, 3, 5, 6, 7)$
Implement the circuit with a decoder constructed with NAND gates and NAND or AND gates connected to the decoder output.
c) What is a comparator?

$$6 + 8 + 2 = 16$$

8. a) Realize $F(A, B, C, D) = \sum(0, 1, 3, 5, 6, 8, 9, 13, 15)$ using 8×1 mux.
b) Draw the logic circuits, truth table and excitation table of J-K flip-flop. Explain how race condition is avoided in J-K flip flop.
c) What is T flip-flop?

$$6 + (6 + 2) + 2 = 16$$

GROUP-D
(COMPUTER ORGANIZATION-I)

9. a) What is instruction format?
b) Explain with example three-address, two-address, one-address and zero- address instruction.
- $4 + 12 = 16$
10. a) What do you mean by Addressing mode? Explain the following address mode:
i) direct
ii) indirect
iii) relative
iv) immediate
b) What is pipelining technique? Differentiate between RISC and CISC.
- $2 + 8 + 2 + 4 = 16$
11. a) Explain the function of cache memory in the memory hierarchy.
b) A digital computer has a memory unit of 64K x 16 and a cache memory of 1K words. The cache uses direct mapping with a block size of four words.
i) How many bits are there in the tag, index, block and word fields of the address format?
ii) How many bits are there in each word of cache and how are they divided into functions?
iii) How many blocks can the cache accommodate?
- $6 + 10 = 16$