WEST BENGAL STATE UNIVERSITY

B.Sc. Honours PART-I Examinations, 2018

COMPUTER SCIENCE-HONOURS

PAPER-CMSA-I

Time Allotted: 4 Hours | Full Marks: 100

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

Answer Q. No. 1 and any *five* from the rest taking at least *one* from each group

1. Answer any ***ten*** questions from the following: 2×10 = 20

   (a) What do you mean by gray code?

   (b) Convert the following to the other canonical form $F(x, y, z) = \Sigma(0,1,3,6)$.

   (c) What are the differences between intrinsic and extrinsic semiconductors?

   (d) What do you mean by peak Inverse voltage?

   (e) What is current amplification factor?

   (f) What is self-bias?

   (g) What is a Mini Super Computer?

   (h) Perform $(233)_4 + (322)_4 = (?)_4$.

   (i) What is the value of largest possible positive number, that can be stored in a computer that has 10-bit word length and uses 2's complement arithmetic?

   (j) Using Boolean Identity prove $A\overline{B}C + B + B\overline{D} + AB\overline{D} + \overline{A}C = B + C$

   $(0.110111)_2 \times 2^5 - (0.1101)_2 \times 2^4 = (?)_2 \times 2^5$

   (k) What are the disadvantages of 8421 code, than pure binary?

   (l) What is Reverse Saturation Current?

   (m) What is drift velocity?

   (n) What do you mean by instruction cycle?

   (o) Differentiate between Data and Information.

Group-A

2. (a) Draw a flowchart to find the LCM of three numbers. 4+4+5+3

   (b) What are the differences between machine language and assembly language?

   (c) What is the need of Hamming code? Give suitable example.

   (d) What do you mean by pseudo codes? Give example.

3. (a) Show diagrammatically, how a 2-input XOR gate could be achieved by connecting only Four (04) 2-input NAND gates. Mention the intermediate values obtained at each step. 4+5+2+5

(b) Find the values of the Boolean Variables A, B, C, D; by solving the set of simultaneous equations

$$AB = AC$$
$$\overline{A} + AB = 0$$
$$AB + A\overline{C} + CD = \overline{C}D$$

(c) Define a BUS.

(d) Make a comparative study between Super, Mainframe, Mini and Personal Computers.

Group-B

(Introduction to Basic Electronics)

4. (a) Why CMOS circuit has become more popular compared to NMOS/PMOS circuits? 3

(b) "The barrier potential across a p-n junction diode cannot be measured by placing a Voltmeter across the diode terminals." – Explain. 4

(c) What is cut-in-voltage? Give its approximate value from a Germanium transistor and a Silicon transistor. 2+2

(d) Explain the operation of half wave rectifier with suitable diagram. 5

5. (a) In an OP-AMP why virtual ground is called virtual? 4+4+4+4

(b) Design and explain a differentiator circuit using OP-AMP.

(c) What are the differences between FET and transistor?

(d) Write short note on SCR.

Group-C

(Digital System Design)

6. (a) Distinguish between Synchronous and Asynchronous counter. 2+3+5+6

(b) Design a 16:1 multiplexer using only 4:1 MUX chips.

(c) Design a 4-bit adder-subtractor circuit using logic gates.

(d) Draw the circuit diagram of synchronous counter using JK flip-flop for the following sequence.

$$0 \to 3 \to 5 \to 7 \to 0 \to 3 \to 5 \to 7 \to \cdots$$

7. (a) What is the main difference between a Decoder of a De-multiplexer? 3

   (b) Differentiate between Latch and Flip-Flop. 3

   (c) How an RS Latch could behave as a static RAM cell? 3

   (d) What are Unipolar and Bipolar DACs? 2

   (e) What are the advantages of Successive Approximation Approach of A/D Conversion? 2

   (f) An 8-bit A/D converter is driven by a 500 kHz CLOCK. Find the maximum conversion time — 1.5×2

   (i) If counter based approach is used.

   (ii) If Successive-Approximation-Method is used.

Group-D

(Computer Organization)

8. (a) Differentiate between SRAM and DRAM. 3+5+8

   (b) Draw a suitable diagram for Direct Memory Access (DMA) and explain its operation.

   (c) What are the different addressing modes? Explain each with suitable example.

9. (a) What are the merits of using a PLA structure? 2

   (b) What is the major problem of EEPROM, from the view point of erasing data? How the Flash Memory has overcome this limitation? (1.5+1.5)

   (c) Make a brief comparison between Bit-Parallel and Bit-Serial organization of Associative Memory. 3

   (d) Briefly discuss on write-through and write-back cache writing policies. (1.5+1.5)

   (e) A computer has a main memory of 64 K × 16 and a cache Memory of 1 K words. The cache uses direct mapping with a block size of 4 words. (2+1.5+1.5)

   (i) How many bits are there in the tag, index and word field of the address format?

   (ii) How many bits are there in each word of cache?

   (iii) How many blocks can the cache accommodate?

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