RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, MARCH 2022

FIRST YEAR [BATCH 2021-24]

Date : 08/03/2022 **COMPUTER SCIENCE (HONOURS)**

Time : 11 am – 1 pm **Paper : I [CC 1]** Full Marks : 50

Answer **any two** questions of the following: [2×2.5]

1. a) Why does a computer require secondary storage?

   b) What is the role of ALU in CPU? [1+1.5]

2. Define algorithm. Write down different characteristics of an algorithm. [1+1.5]

3. a) Write down classification of data types in C programming language.

   b) Write down one difference between flowchart and algorithm. [2+0.5]

Answer **any two** questions of the following: [2×7.5]

4. a) Write down the differences between "System software" and "Application software".

   b) What do you mean by format-specifier? Give four examples.

   c) Write an example of nested loop.

   d) Write an example of infinite loop.

   e) What are different primary storages available in a computer? [2+1.5+2+1+1]

5. a) Write down the differences between break and continue.

   b) Write down the differences between structure and union.

   c) What do you mean by type casting?

   d) What do you mean by macros? Explain with suitable example. [2+2+1.5+2]

6. a) What is the difference between call-by-value and call-by-reference?

   b) What are the storage classes in C programming language?

   c) What do you mean by null pointer?

   d) Explain with suitable example the dynamic memory allocation? [2+2+1+2.5]

Answer **any three** questions of the following: [3×10]

7. a) How many bits of information are required to represent $(10^5)_{10}$ in binary form? For the given number $(26570.34)_r$, find the value of r for which that will be a valid representation. [1+1]

   b) Do the following base conversions:

   i) $(11001101.1001)_2 = (?)_{10}$; [Both are in sign-magnitude form]

   ii) $(BAD.F)_{16} = (?)_8 = (?)_2$

   iii) $(567.06)_8 = (?)_5$ [1+1+1]

c) Do the following arithmetics:

i) $(6630.54)_8 - (2356.06)_8$ ii) $(ABCD.EF)_{16} + (6543.21)_{16}$ iii) $(101.01)_2$ X $(11.1)_2$ [1+1+1]

d) If r's complement of $\mathbf{N_r}$ is $\mathbf{N_r'}$, then show that complement of $\mathbf{N_r'}$ should be $\mathbf{N_r}$. [2]

8. a) Why and when do we need BCD correction after doing BCD addition or subtraction? Let us consider two BCD numbers to be added using binary adders. The binary representation of these numbers are (0100 1001 0101)2 and (0011 0101 1001)2 respectively. Perform the addition and express the result in BCD. [1+2]

b) Here in this problem, consider that all the numbers are BCD and represented by binary form of various BCD schemes. Then evaluate if $(1100)_{5\text{-}4\text{-}2\text{-}1}$ is valid BCD or not. If the given number is valid then find its corresponding representation in $8 - 4 - \overline{2} - \overline{1}$ BCD scheme. [1+1+2]

c) Compare Unit-distance BCD coding and Reflected BCD coding. [1]

d) What is ASCII? If 'A' and 'a' are represented in ASCII by $(0100\ 0001)_2$ and $(0110\ 0001)_2$, then find code for 'Dead'. [2]

9. a) State the advantages and disadvantages while using Block Parity method for detecting errors in binary data transmission. [2]

b) What is Hamming Code? Obtain Hamming Code for a 4-bit data 1101. [1+2]

c) For 74XX series ICs it is customary to represent input or output voltages ranging 0 Volt – 0.8 Volt as logic 0 state whereas 3.0 Volt – 5.0 Volt as logic 1 state. Consider that a logic circuit is designed using only 74XX series ICs and its output is noted to be 2.65 Volt. What can we conclude here? Explain briefly. [2]

d) Write the Commutative and Distributive property for Boolean Switching algebra. Prove that $X.Y + \overline{X}.Z + Y.Z = X.Y + \overline{X}.Z$ [1+2]

10. a) What do you mean by universal gates? Obtain NOR operation using few NAND gates and vice-versa. [1+2]

b) Write Shanon's Expansion theorem for three variables. Using Shanon's Expansion theorem, prove that: $A.\left(\overline{B.C}\right) + \left(\overline{A} + B\right).C = A + C$. [1+2]

c) What do you mean by minterms and maxterms? Mention relations between them. If a three variable switching function contains all the minterms in SoP representation, then show that the function must be equal to 1. [1+1+2]

11. a) A three variable switching function has maxterms M_i in its PoS representation, where i = 0, 1, 4 and 5. Obtain the same function in canonical SoP and also obtain its simplified expression in non-canonical SoP. [2+1]

b) A four variable Boolean function is expressed in PoS using maxtrems M_0, M_2, M_8 and M_{10}. Obtain its K-map and using that map obtain the non-canonical SoP for the same function. In this context mention why the variables are numbered in unit-distance form while drawing K-map. [1+1+1]

c) Define prime implicate and essential prime implicate. For the following function obtain essential prime implicants, redundant prime implicants and distinguished minterms:

$F = \overline{Y}.Z + Y.\overline{Z} + \overline{X}.\overline{Y} + \overline{X}.\overline{Z}$, [1+3]

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