2007

COMPUTER SCIENCE (General)

First Paper

(Revised New Syllabus)

Time : Two Hours   Full Marks : 50

The figures in the margin indicate full marks.

Answer question no. 1 and any *two* from the rest.

1. (a) Select the correct answer (any *five*) :   5×1=5

    (i) Find the odd one out.

        (a) $A + BC$ (b) $(A + B) (A + C)$

        (c) $A + BC + ABC$ (d) $AB + AC$

    (ii) Which of the following is a sequential circuit ?

        (a) Flip-flop   (b) Decoder

        (c) Full adder   (d) Multiplexer

    (iii) The main components of a second generation computer were the

        (a) Relays   (b) Transistors

        (c) Vacuum tubes   (d) SSI chips.

    (iv) '1042' belongs to the — number system.

        (a) Binary   (b) Hexadecimal

        (c) Decimal   (d) Octal.

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(v) Which one of the following is not related to a flip-flop ?

    (a) Hold time   (b) Response time

    (b) Setup time   (d) Propagation delay time.

(vi) In a 4-bit 2's-complement representation of binary integers, 1000 means

    (a) + 0 (b) − 0 (c) + 8 (d) −8

(vii) Artificial intelligence is related to the _____ generation computers.

    (a) Second (b) Third (c) Fourth (d) Fifth.

(b) State True or False (T/F) :   1×5=5

    (i) An operating system directly interacts with the hardware.

    (ii) 1 Kilobytes = 1000 bytes.

    (iii) Mantissa is a part of floating-point member.

    (iv) D-flip-flops are used to make A/D converters.

    (v) The number of outputs in a cycle of a 4-bit ring counter is 4.

2. (a) What do you mean by computer generation ? Describe the main features of the third generation computer.   2+6=8

(b) What are pseudo codes ? Discuss the benefits of using pseudo codes in a programming environment.   2+4=6

(c) What do you mean by structured programming ? Brief the essential features and the merits of structured programming.   2+4=6

3. (a) Discuss the different types of representation of signed binary number from the comparative perspective. Brief the advantage and disadvantage of floating-point representation.   5+(2+2)=9

(b) Convert the decimal number -37.1_{10} to 16-bit 2's complement binary, with 8 bits of integer part and 8 bits of fractional part. Find the decimal value of 110011.0101_2 when interpreted as a 2's - complement number.   5+3=8

(c) Write a short note on BCD representation.   3

4. (a) Write a note on Alphanumeric codes.   8

(b) A bank vault has three locks with a different key for each lock. In order to open the door, at least two keys must be inserted into the assigned locks. Signal lines A, B and C are 1 if there is a key inserted into lock 1, 2 or 3 respectively. The door will open if and only if the signal line Y is 1. Draw the truth table for this situation. Write down the corresponding boolean equation. Reduce the same using a K-Map.   3+3+4=10

(c) Prove the $A + A'B = A + B$.   2

5. (a) Draw the logic circuit of a full adder and explain its operation with the help of a truth table. Prove that a full-adder can also be built by using half-adders.   (2+3)+3=8

(b) Design a 4-bit register having capabilities of both serial (shift) and parallel (broadside) loading.   7

(c) Design a 4×16 decoder using 3×8 decoders having enable input.   5

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Second Paper

(Revised New Syllabus)

Time : Two Hours   Full Marks : 50

The figures in the margin indicate full marks.

Answer question no. 5 and any *two* from the rest.

1. (a) Consider the following arithmetic expression P, written in postfix notation :

$$P : 12, 7, 3, -, /, 2, 1, 5, +, *, +$$

    (i) Translate P, by inspection and hand, into its equivalent infix expression.

    (ii) Evaluate the infix expression.

  (b) Write an algorithm to covert an infix expression to postfix expression.   10+10=20

2. (a) Write algorithm to insert and delete elements in a singly linked list.

  (b) What is the difference between array and linked list ?

  (c) Define dequeue and priority queue.   12+4+4=20

3. (a) Explain bubble sort algorithm along with a suitable example.

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8/71-370

(b) Is it possible to minimize the number of passes of bubble sort algorithm ? Explain.   16+4=20

4. (a) Write an algorithm to find an element from a list using Binary Search. Explain with a suitable example.

(b) Show that worst case time complexity of Binary Search algorithm is

$$W(n) = 1 + \left[\log_2 n\right].$$ 15+5=20

5. Consider the following 4 digit employee numbers :

9614, 5882, 6713, 4409, 1825.

Find the 2-digit hash address of each number using (a) the division method, with m=97; (b) the midsquare method; (c) the folding method without reversing; and (d) the folding method with reversing.   10

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