2021

COMPUTER SCIENCE — GENERAL

First Paper

Full Marks : 100

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer **question no.** **1** and **any five questions** from the rest, taking at least **one** from each **Group**.

1. Answer **any ten** questions : 2×10

    (a) Differentiate between compilers and interpreters.

    (b) Differentiate between assembly level language and high level language.

    (c) Using Boolean Algebra prove $x'y + xz + yz = x'y + xz$.

    (d) Differentiate between SRAM and DRAM.

    (e) Find the value of $35 - 76$ using 2's complement technique. Show the steps.

    (f) What is the difference between latch and flip-flop?

    (g) Convert $(672 \cdot 483)_8$ to binary.

    (h) Write two differences between synchronous counter and asynchronous counter.

    (i) Define fan_in and fan_out.

    (j) Write two differences between memory mapped I/O and I/O mapped I/O.

    (k) How you identify memory reference instruction and I/O reference instruction?

    (l) State the advantage of one address instruction over two address instruction.

    (m) Define : context switch.

    (n) Mention two advantages of demand paging.

    (o) What is spooling?

Group-A

(General Concepts)

2. (a) Explain the use of primary and secondary memories of a computer.

    (b) What are the features of application software? Give example.

    (c) Write different features of OOPS.

    (d) Write short notes on computer virus.

    (e) Differentiate between 3GL and 4GL. 4+3+3+3+3

Please Turn Over

3. (a) What is relocating loader? What are its advantages over absolute loader?

   (b) Write the characteristics of Von-Neumann Architecture machine.

   (c) What is the function of cache memory? Briefly discuss a technique of accessing cache memory.

   (d) Write the name of various phases of a compiler.   (2+2)+4+(2+4)+2

Group-B
[Digital Logic Design]

4. (a) Design a J-K flip-flop using NAND gates only.

   (b) Simplify using K-map

   $$f = \sum(1,3,4,8,11,14) + \sum_d(0,5,13,15)$$

   (c) Design a 8×1 MUX by using two 4×1 multiplexers.   5+6+5

5. (a) Design a Full Adder using two half adders and an OR gate.

   (b) Implement BCD to Excess-3 code converter.

   (c) Explain JK flip-flop with a diagram.   6+6+4

Group-C
[Computer Architecture and Organisation]

6. (a) Briefly describe how a DMA data transfer is performed in a computer system with suitable block diagram.

   (b) What is the importance of Program status word?

   (c) Explain the function of program counter and stack pointer.

   (d) Give examples of two-address and three address instructions.   6+3+3+4

7. (a) Define Addressing Mode. Write short notes on :

      (i) Index Addressing Mode

      (ii) Register Addressing Mode.

   (b) Compare and contrast CISC and RISC architecture.

   (c) Write a program to evaluate the arithmetic statement : $E = A - B + C *(D - E) / (F + G)$ using a general register computer with three address instructions.   6+4+6

Group-D
[Operating System]

8. (a) Define deadlock. What are the necessary conditions for a deadlock to occur?

(b) Consider the following reference string :

1, 3, 2, 7, 2, 1, 4, 6, 2, 4, 2, 6, 7, 8, 3, 2, 4, 2, 3, 6. How many page faults will occur for 4 page frames for each of the following algorithms?

 (i) Optimal page replacement

 (ii) LRV.

(c) Consider the following processes with burst time in milliseconds

Process	CPU Burst Time (ms)
P_1	15
P_2	5
P_3	7
P_4	10

Draw the Gantt chart for Round Robin scheduling where time quantum q = 5ms. Calculate average waiting time. (1+4)+6+5

9. (a) What is semaphore? Briefly explain the role of semaphore in critical section problem.

(b) Differentiate between process and program. Discuss briefly about different process states with a suitable process state diagram.

(c) What is virtual memory and discuss the advantages of using it. (2+4)+(3+3)+(2+2)