# 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

**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)

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