

Total number of printed pages-15

3 (Sem-5/CBCS) CSC HE 1/HE 2

2022

COMPUTER SCIENCE

(Honours Elective)

Answer the Questions from any one Option.

OPTION-A

Paper : CSC-HE-5016

(Microprocessor)

DSE (H) -I

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer **any seven** of the following questions: 1×7=7

(a) What is an instruction ?

(b) Opcode stands for _____.

(Fill in the blank)

Contd.

(c) In MOV A, B instruction MOV is operand and A, B is opcode.

(State True or False)

(d) What is meant by interrupt ?

(e) No. of T-States required for opcode fetch machine cycle is _____.

(Fill in the blank)

(f) MVI A, 07H is a _____ byte instruction.

(Fill in the blank)

(g) _____ is the practice of reconfiguring a PC to operate a CPU at a higher clock speed than the normal speed.

(Fill in the blank)

(h) What is CMA ?

(i) One byte can be pushed into a stack of 8085.

(State True or False)

(j) The smallest unit of time at which processing takes place is called _____.

(Fill in the blank)

(k) Full form of ALE is _____.

(Fill in the blank)

(l) A parallel bus uses an encoder and a decoder.

(State True or False)

2. Answer **any four** of the following questions :

2×4=8

(a) What is Stack Pointer ?

(b) What operation can be performed by using the instruction DAA ?

(c) Why databus of 8085 is called multiplexed databus ?

(d) What are the different data formats ?

(e) What is the difference between RLC and RAL instructions ?

(f) What is the need for timing diagram ?

(g) What is vectored interrupt ?

(h) What is control word ?

3. Answer **any three** of the following questions :

5×3=15

(a) Discuss the addressing modes of 8085 and give example for each.

(b) Write a program to transfer a block of data from one location to the other.

(c) What is stack ? Explain the use and operation of stack and stack pointer ?

- (d) Give *any five* 8085 instructions for data transfer.
- (e) How does the microprocessor differentiate among a positive number, a negative number and a bit pattern ?
- (f) Draw and explain timing diagram of memory read machine cycle.
- (g) Draw the block diagram and write basic functions of 8237 PPI.
- (h) Compare the memory mapped I/O and standard I/O mapped I/O.

4. Answer **any three** the following questions :
 $10 \times 3 = 30$

- (a) Draw the functional block diagram of 8085 microprocessor and discuss its operation.
- (b) Interface IC 8255 to microprocessor 8085 with port A address 98H and write a program in BSR mode to generate 100 pulses at the rate of 200 Hz and duty cycle 40%.
- (c) Write a program to sort an array.
- (d) Explain the function of IO/\overline{M} , READY, HOLD and HLDA in 8085.

- (e) Write a program in assembly language to find the difference of two numbers and store the result in a memory location 8830h.
- (f) Write an assembly language program to multiply and divide two 8-bit numbers.
- (g) Write an assembly language program to convert an 8-bit binary data to BCD. The binary data is stored in 4200H. Store the hundred's digit in 4251H. Store the tens and unit's digits in 4250H.
- (h) Explain the architecture and functions of 8255A.

OPTION-B

Paper : CSC-HE-5026

(Numerical Methods)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Choose the correct option : **(any seven)** 1×7=7
- (a) Which of the following is an iterative method ?
- (i) Gauss-Seidel
 - (ii) Gaussian elimination
 - (iii) Factorization
 - (iv) Gauss-Jordan
- (b) Which of the following is also known as Newton-Raphson method ?
- (i) Chord method
 - (ii) Tangent method
 - (iii) Diameter method
 - (iv) Secant method

- (c) In IEEE 32-bit representation, the mantissa of the fraction is said to occupy _____ bits.
- (i) 24
 - (ii) 23
 - (iii) 20
 - (iv) 16
- (d) Interpolation is a method of
- (i) Interrelating
 - (ii) Estimating
 - (iii) Integrating
 - (iv) Combining
- (e) The convergence of which of the following method depends on initial assumed values
- (i) False position
 - (ii) Gauss-Seidel
 - (iii) Newton-Raphson
 - (iv) Euler method

(f) The highest order of polynomial integrand for which Simpson's $\frac{1}{3}$ rule of integration is exact is :

- (i) first
- (ii) second
- (iii) third
- (iv) fourth

(g) The number of significant digits in the number 203.02005 is :

- (i) 4
- (ii) 6
- (iii) 8
- (iv) 9

(h) The Gauss-Jordan method reduces an original matrix into a/an

- (i) Skew-Hermitian matrix
- (ii) Non-symmetric matrix
- (iii) Identity matrix
- (iv) Null matrix

(i) The symbol used to backward difference operator is :

- (i) Δ
- (ii) ε
- (iii) ∇
- (iv) μ

(j) Newton-Raphson formula is derived from

- (i) Binomial theorem
- (ii) Bisection formula
- (iii) Roll's theorem
- (iv) Taylor's theorem

(k) The order of convergence of iteration method is

- (i) 3
- (ii) 0
- (iii) 1
- (iv) 2

(l) Newton forward interpolation formula is used for _____ intervals.

(i) open

(ii) unequal

(iii) equal

(iv) closed

2. Write short answer of the following :

(any four) $2 \times 4 = 8$

(a) Rounding-off the number 0.01015 to three significant figures and find the relative error of the resulting approximation.

(b) Write a short note on 'floating point representation'.

(c) Add 0.5678×10^4 with 0.6666×10^4

(d) What is interpolation in numerical analysis ?

(e) What is partial pivoting ?

(f) Write the statement of Lagrange's formula for interpolation.

(g) Write an algorithm of Euler method for the solution of an ordinary differential equation.

(h) Evaluate $\Delta^1 \left(\frac{1}{x} \right)$ by taking '1' as the interval of differencing.

3. Answer **any three** of the following questions : $5 \times 3 = 15$

(a) The solution of a problem is given as 5.497 and it is given that the relative error is not more than 1%. Find to four decimal places the range of values within which the exact value of the solution must lie.

(b) If $a = 0.5555 \text{ E}1$

$b = 0.4545 \text{ E}1$

$c = 0.5058 \text{ E}1$

show that $(a + b) - c \neq (a - c) + b$

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(c) Find a real root of the equation $x^3 - 9x + 1 = 0$, using the Bisection method correct to two significant figures.

(d) Solve the following system of equations by Gauss elimination method :

$$\begin{aligned} x + y + 2z &= 4 \\ 3x + y - 3z &= -4 \\ 2x - 3y - 5z &= -5 \end{aligned}$$

(e) If $f(x)$ is a polynomial of degree 2, prove that

$$\int_0^1 f(x) dx = \frac{1}{12} [5f(0) + 8f(1) - f(2)]$$

(f) Given

$x:$	1	2	3	4	5	6	7	8
$f(x)$	1	8	27	64	125	216	343	512

Estimate $f(7.5)$.

(g) Obtain a formula for Simpson's one-third rule for the polynomial $y = f(x)$.

(h) Compute $y(0.5)$ using Euler's method for the differential equation

$$\frac{dy}{dx} = y^2 - x^2$$

With $y = 1$ when $x = 0$

4. Answer **any three** of the following questions : 10×3=30

(a) Derive a formula for Newton-Raphson method to determine a real root of the equation $f(x) = 0$. Give a geometrical interpretation of the formula.

(b) Solve the following system of linear equations by Jacobi iteration method, correct to two decimal places

		$10x - 5y - 2z = 3$
8.0	0.7	$4x - 10y + 3z = -3$
2.5	2.3	$x + 6y + 10z = -3$

(c) Find an interpolation formula for the function $y = f(x)$ with equal intervals.

(d) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by using

Simpson's 'one-third' and 'three-eight' rule. Hence obtain the approximate value of π in each case.

(e) Find y , when $x=1$, given that $y=1$ when $x=0$, for the equation

$$\frac{dy}{dx} = \frac{y-x}{y+x}$$

by using Runge-Kutta second order method.

(f) Find the first and second derivatives of the function tabulated below at the point $x=0.6$

$x:$	0.4	0.5	0.6	0.7	0.8
$y:$	1.58	1.79	2.04	2.23	2.65

(g) Discuss the various types of errors that occur while performing numerical computation. Represent the number 12.5 in 32 bit floating point format.

(h) What do you mean by pivoting ? Discuss Gauss-elimination method for a system of equations for three unknowns.