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)

(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 a 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 : 10×3=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 pluses 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)*** $1 \times 7 = 7$

   (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)*** 2×4=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 : 5×3=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 $a = 0.5555\ E1$

$b = 0.4545\ E1$

$c = 0.5058\ E1$

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

(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 :

$$x + y + 2z = 4$$
$$3x + y - 3z = -4$$
$$2x - 3y - 5z = -5$$

(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

$$10x - 5y - 2z = 3$$
$$4x - 10y + 3z = -3$$
$$x + 6y + 10z = -3$$

(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.

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