3 (Sem–5/CBCS) CSC HE 1/HE 2

2024

COMPUTER SCIENCE

(Honours Elective)

Answer the Questions from any one Option.

OPTION–A

Paper : CSC–HE–5016

(Microprocessor)

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.

OPTION–A

Paper : CSC–HE–5016

(Microprocessor)

1. Answer the following questions : 1×7=7

   (a) What is an opcode ?

   (b) What is ALE ?

   (c) A microprocessor is a _____ chip integrating all the functions of a CPU of a computer. *(Fill in the blank)*

   (d) Which of the following is correct about 8085 microprocessors ?

   (i) Intel's 8-bit processor

   (ii) Motorola's 8-bit processor

   (iii) STMICROELECTRONICS 8-bit processor

   (iv) NanoXplore 8-bit processor

   (e) Define memory word.

   (f) What operation can be performed by using the instruction ADD A ?

   (g) How many address lines in a 4096 × 8 EPROM CHIP ?

2. Answer the following questions : 2×4=8

   (a) Explain the contents of the accumulator after the execution of the following program segments :

   ```
   MOV A, #3CH
   CMA
   ```

   (b) Write instructions to load the hexadecimal numbers 65H in register C, and 92h in the accumulator A. Display the number 65H at PORT0 and 92H at PORT1.

   (c) What is the vectored interrupt ?

   (d) Write down the control and status signals.

3. Answer ***any three*** of the following questions : 5×3=15

   (a) What are the programmer-visible registers of 8085 ?

   (b) Write the logical steps to add the following two Hex numbers. Both the numbers should be saved for future use. Save the sum in the accumulator. Numbers : A2H and 18H.

   (c) If the 8085 adds 87H and 79H, specify the contents of the accumulator and the status of the S, Z, and CY flags.

(d) Explain opcode fetch machine cycle of 8085.

(e) Draw architectural block diagram of 8085.

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

(a) Write a program in assembly language to generate a delay of 50 *msec* using LOOP instruction of 8086.

(b) Write an 8085 assembly language program using minimum number of instructions to add the 16-bit number. in BC, DE and HL. Store the 16-bit result in DE pair.

(c) Write an 8085 program to add two 16-bit numbers and store the result in location 0500H.

(d) Draw the block diagram of 8255 and explain its working.

(e) Describe the flags available in 8085A microprocessor.

(f) Discuss the various addressing modes of 8085. Give example.

OPTION-B

Paper : CSC-HE-5026

(Numerical Methods)

1. Answer the following questions as directed : 1×7=7

(a) Convergence of the Newton's method depends on the initial approximation to the root. *(State true* ***or*** *false)*

(b) The Gauss Elimination method is based on the idea of reducing the given system of equations $Ax = b$ to an upper triangular system of equations $Ux = z$, using elementary row operations. *(State true* ***or*** *false)*

(c) The Gauss-Jordan method is based on the idea of reducing the given system of equations $Ax = b$ to a diagonal system of equations $Ix = d$, where I is the identity matrix, using elementary row operations. *(State true* ***or*** *false)*

(d) Newton-Gregory forward interpolation formula can be used

(i) only for equally spaced intervals

(ii) only for unequally spaced intervals

(iii) for both equally and unequally spaced intervals

(iv) for unequally intervals

(Choose the correct option)

(e) The trapezium rule integrates exactly polynomial of degree ≤ 1.

*(State true **or** false)*

(f) _____ method involves dividing the ODE into smaller time steps and calculating the approximate solution iteratively at each step.

(Fill in the blank)

(g) The first two steps of the fourth-order Runge-Kutta method use _____.

(i) Euler methods

(ii) Forward Euler method

(iii) Backward Euler method

(iv) Explicit Euler method

(Choose the correct option)

2. Define the following terms : 2×4=8

(a) Roundoff error

(b) Truncation error

(c) Consistent system of equations

(d) Backward difference

3. Answer ***any three*** of the following questions : 5×3=15

(a) Describe Method of False Position.

(b) Describe Newton-Raphson Method.

(c) Construct the forward difference table for the data given below :

x	−1	0	1	2
$f(x)$	−8	3	1	12

(d) Evaluate $\int_1^2 \frac{dx}{5+3x}$ with 4 subintervals using the trapezium rule.

(e) Solve the initial value problem $yy' = x$, $y(0) = 1$, using the Euler method in $0 \leq x \leq 0{\cdot}8$, with $h = 0{\cdot}2$.

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

(a) Perform four iterations of the Newton's method to find the smallest positive root of the equation $f(x) = x^3 - 5x + 1 = 0$.

(b) Solve the system of equations

$$3x_1 + 3x_2 + 4x_3 = 20$$
$$2x_1 + x_2 + 3x_3 = 13$$
$$x_1 + x_2 + 3x_3 = 6$$

using the Gauss elimination method.

(c) Solve the following system of equations :

$$x_1 + x_2 + x_3 = 1$$
$$4x_1 + 3x_2 - x_3 = 6$$
$$3x_1 + 5x_2 + 3x_3 = 4$$

using the Gauss-Jordan method with partial pivoting.

(d) Explain Romberg integration method.

(e) Explain 4th order Runge-Kutta method.

(f) Explain cubic spline interpolation method.