

# B.Sc (HONS.) IN CSE PART-II, FOURTH SEMESTER EXAMINATION, 2019

CSE

Subject Code : 520221

[According to the New Syllabus]

(Database Management System)

Time—3 hours

Full marks—80

[N.B. The figures in the right margin indicate full marks. Answer any four questions.]

Marks

1. (a) What do you mean by DBMS? Discuss advantages of DBMS over file processing system. 6
- (b) Write down the functions of Database Administrator (DBA). 4
- (c) Discuss the different levels of data abstraction. 5
- (d) Draw the overall system structure of DBMS. 5
2. (a) Explain the distinctions among the terms primary key, candidate key and super key. 6
- (b) What are null values? Can primary key of a query contain null values? Justify your answer. 3
- (c) Construct an E-R diagram for a car insurance company that has a set of customers, each of whom owns one or more cars. Each car has associated with it zero to any number of recorded accidents. 6
- (d) Define weak entity set. Briefly explain generalization and specialization with example. 5
3. (a) Describe the basic structure of an SQL expression. 4
- (b) Explain the parts of SQL language. 4
- (c) Consider the following employee database : 4×3=12
  - employee (employee-name, street, city)
  - works (employee-name, company-name, salary)
  - company (company-name, city)
  - manages (employee-name, manager-name)

Write down the SQL command for the following queries :

  - (i) Find the names of all employees who work for First Bank Corporation.
  - (ii) Find the names and cities of residence of all employees who work for First Bank Corporation.
  - (iii) Find the names, street address and cities of residence of all employees. Who work for First Bank Corporation and earn more than \$ 10,000.
  - (iv) Find all employees in the database who live in the same cities as the companies for which they work.

[Please turn over]



- |                                                                                                                                                                | Marks |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 4. (a) Describe the process of database modification with example.                                                                                             | 5     |
| (b) What are the differences between assertions and triggers?                                                                                                  | 5     |
| (c) Explain about lossless Join Decomposition.                                                                                                                 | 5     |
| (d) Compute the closure of the following set F of functional dependencies for relation schema :<br>R = (A, B, C, D, E) —<br>A → BC<br>CD → E<br>B → D<br>E → A | 5     |
| 5. (a) What is indexing? Describe different types of indexing briefly.                                                                                         | 6     |
| (b) Distinguish between :<br>(i) Fixed length records and variable length record.<br>(ii) Sparse index and dense index.                                        | 6     |
| (c) Define access time, average seek time and average latency time from hard drive.                                                                            | 4     |
| (d) How does database indexing affect the performance of a database?                                                                                           | 4     |
| 6. (a) What is distributed database? Explain the advantages of distributed database over centralized database.                                                 | 4     |
| (b) What is fragmentation? Explain different types of fragmentation with example.                                                                              | 6     |
| (c) Describe shared memory parallel database architecture briefly.                                                                                             | 6     |
| (d) Write down the differences between relational database and object oriented database.                                                                       | 4     |



**B.Sc (HONS.) IN CSE PART-II, FOURTH SEMESTER EXAMINATION, 2019**

**CSE**

*[According to the New Syllabus]*

**Subject Code : CSE-520223**

**(Microprocessor and Assembly Language)**

Time—3 hours

Full marks—80

*[N.B. The figures in the right margin indicate full marks. Answer any four questions.]*

- |                                                                                                                                    | Marks |
|------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1. (a) Draw the internal architecture of 8086 and explain the functional units of it.                                              | 4+4=8 |
| (b) Explain register-based and accumulator-based microprocessor.                                                                   | 5     |
| (c) What is microprocessor? Write some important features of each generation of microprocessor.                                    | 2+5=7 |
| 2. (a) Discuss briefly 80286 microprocessor with figure.                                                                           | 5     |
| (b) What is microcontroller? Write down the differences between microcontroller and microprocessor.                                | 1+4=5 |
| (c) What physical address is represented by—<br>(i) 5462 : 2D1EH<br>(ii) 46AB : 3FFCH                                              | 6     |
| (d) What is flag register? Describe 8086 flag register.                                                                            | 4     |
| 3. (a) Describe different types of addressing mode used in 8086.                                                                   | 6     |
| (b) Suppose AX contains 5BAFH and BX contains 43DCH. After the operation of ADD AX, BX find the contents of CF, SF, ZF, PF and OF. | 5     |
| (c) What do you mean by assembler, linker and loader?                                                                              | 3     |
| (d) What is segmented memory? Write down the advantages of segmented memory.                                                       | 6     |
| 4. (a) Define hardware and software interrupts.                                                                                    | 4     |
| (b) Brief different types of dedicated interrupt.                                                                                  | 5     |
| (c) Mention some functions of a coprocessor. Describe 8087 with figure.                                                            | 2+4=6 |
| (d) Write an assembly language program to convert lower case letter to upper case.                                                 | 5     |

*[Please turn over]*

- |                                                                                      | Marks |
|--------------------------------------------------------------------------------------|-------|
| 5. (a) Explain memory write cycle by timing diagram.                                 | 5     |
| (b) How does DMA transfer work? Explain with suitable diagram.                       | 5     |
| (c) Design 8KX8 RAM module using 2KX8 RAM chip.                                      | 5     |
| (d) What will be the value of AX register after execution of the following code :    | 5     |
| <pre> MOV CX, 10 MOV AX, 0 MOV DX, 1 REPEAT : ADD AX, DX INC DX LOOP REPEAT </pre>   |       |
| 6. (a) Write short note on bit slice processor.                                      | 5     |
| (b) Write an assembly language program to determine whether a number is odd or even. | 5     |
| (c) What are the differences between a MACRO and PROCEDURE?                          | 5     |
| (d) Differentiate between RISC and CISC microprocessor.                              | 5     |



**B. Sc (HONS.) IN CSE PART-II, FOURTH SEMESTER  
EXAMINATION, 2019**

**CSE**

*[According to the New Syllabus]*

**Subject Code : 520225**

**(Design and Analysis of Algorithms)**

Time—3 hours

Full marks—80

*[N.B. The figures in the right margin indicate full marks. Answer any four questions.]*

- |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Marks |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1. (a) | What do you mean by an algorithm? Write down the basic characteristics of an algorithm.                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6     |
| (b)    | Explain the time and space complexity of an algorithm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5     |
| (c)    | How can you validate algorithms? Briefly explain the process of validation with example.                                                                                                                                                                                                                                                                                                                                                                                                                                             | 4     |
| (d)    | Determine the frequency of all statements and hence the complexity of the following algorithm :<br><div style="margin-left: 40px;"> <b>Algorithm Mult (<math>a, b, c, n</math>)</b><br/> {<br/>   for <math>i := 1</math> to <math>n</math> do<br/>     for <math>j := 1</math> to <math>n</math> do<br/>       {<br/>         <math>c[i, j] = 0</math>;<br/>         for <math>k := 1</math> to <math>n</math> do<br/>           <math>c[i, j] := c[i, j] + a[i, k] * b[k, j]</math>;<br/>       }<br/>     }<br/>   }<br/> }</div> | 5     |
| 7. (a) | What is divide and conquer method? Write some properties and applications of divide and conquer method.                                                                                                                                                                                                                                                                                                                                                                                                                              | 4     |
| (b)    | Calculate the average case complexity of quick sort algorithm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6     |
| (c)    | Write down the recursive Binary search algorithm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5     |
| (d)    | Perform merge sort for the following list of numbers :<br>650, 745, 250, 852, 180, 256, 351, 420, 916, 132.                                                                                                                                                                                                                                                                                                                                                                                                                          | 5     |

*[Please turn over*

3. (a) What is knapsack problem? Consider the following instances of the knapsack problem :

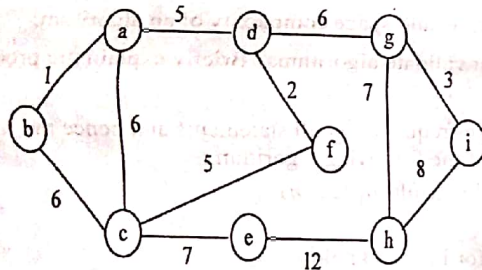
4

- (i) Total object,  $n = 3$
- (ii) Total capacity,  $m = 20$
- (iii) Profits  $(P_1, P_2, P_3) = (15, 20, 25)$
- (iv) Weights  $(W_1, W_2, W_3) = (10, 15, 18)$

find an optimal solution to the knapsack instance.

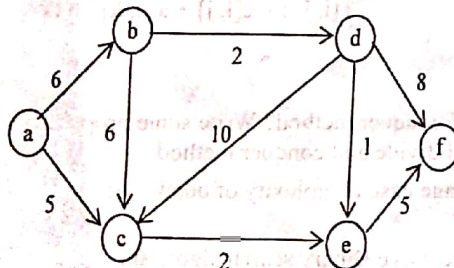
(b) Define spanning tree. For the undirected graph given below, write the sequence of edges visited during the execution of Prim's algorithm to construct a minimum cost spanning tree :

6



(c) What is single source shortest paths problem? Consider the following graph and find the shortest path from node a by using Dijkstra's algorithm :

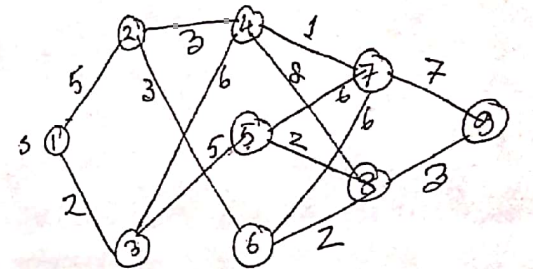
6



(d) Write down the differences between greedy method and dynamic programming.

4

4. (a) Discuss the principle of optimality. 3
- (b) Describe travelling salesperson problem with suitable example. 6
- (c) Write an algorithm for all pairs shortest path. 5
- (d) What is multistage graph? Calculate the minimum cost path from  $s$  to  $t$  in the multistage graph below using forward and backward approach : 6



5. (a) Write down the Breadth First Search (BFS) algorithm for traversing a graph. 5
- (b) What is  $n$ -queen problem? Draw the state space tree for the 4-queens problem. 7
- (c) What do you mean by feasible solution and optimal solution? 3
- (d) Distinguish between backtracking and branch and bound algorithm. 5
6. (a) Write a non-deterministic algorithm for searching an element in an array. 5
- (b) Describe the relationship between P, NP, NP-Hard and NP-complete problem. 6
- (c) Write down the control abstractions for LC-search. 4
- (d) Write down the differences between Linear search and Binary search. 5



## B. Sc (HONS.) IN CSE PART-II, FORTH SEMESTER EXAMINATION, 2019

CSE

*[According to the New Syllabus]*

Subject Code : CSE-520227

(Numerical Analysis)

Time—3 hours

Full marks—80

*[N.B.—The figures in the right margin indicate full marks. Answer any four questions.]*

- |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Marks |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------------|---|----|----|----|----|----|----|----------------|--|--|--|--|--|--|--|--|
| 1.             | (a) Define algebraic and transcendental equation with example.                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4     |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
|                | (b) State and prove Bisection Method.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 8     |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
|                | (c) Using Bisection Method, find the roots of the equation $x^2 - 4x - 10 = 0$ .                                                                                                                                                                                                                                                                                                                                                                                                                          | 8     |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
| 2.             | (a) What do you understand by Interpolation?                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2     |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
|                | (b) Establish Newton's Forward interpolation formula for equal interval for $y = f(x)$ .                                                                                                                                                                                                                                                                                                                                                                                                                  | 8     |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
|                | (c) The following table gives the population of a town during the last six censuses. Estimate using any suitable interpolation formula the increase in the population during the period from year 1946 to 1948.                                                                                                                                                                                                                                                                                           | 10    |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
|                | <table border="0" style="width: 100%;"> <tr> <td style="width: 10%;">Year</td> <td style="width: 10%;">:</td> <td style="width: 10%;">1911</td> <td style="width: 10%;">1921</td> <td style="width: 10%;">1931</td> <td style="width: 10%;">1941</td> <td style="width: 10%;">1951</td> <td style="width: 10%;">1961</td> </tr> <tr> <td>Population</td> <td>:</td> <td>12</td> <td>15</td> <td>20</td> <td>27</td> <td>39</td> <td>52</td> </tr> <tr> <td colspan="8">(In thousands)</td> </tr> </table> | Year  | :    | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 | Population | : | 12 | 15 | 20 | 27 | 39 | 52 | (In thousands) |  |  |  |  |  |  |  |  |
| Year           | :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1911  | 1921 | 1931 | 1941 | 1951 | 1961 |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
| Population     | :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 12    | 15   | 20   | 27   | 39   | 52   |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
| (In thousands) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
| 3.             | (a) Define Numerical Integration. Derive general integration formula to compute $\int_a^b f(x)dx$ .                                                                                                                                                                                                                                                                                                                                                                                                       | 1+6=7 |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
|                | (b) Find the value of $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rules. Hence obtain the value of $\pi$ in each case.                                                                                                                                                                                                                                                                                                                                                 | 6     |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |
|                | (c) Derive Romberg Integration Method.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 7     |      |      |      |      |      |      |      |            |   |    |    |    |    |    |    |                |  |  |  |  |  |  |  |  |

*[Please turn over]*

Marks

4. (a) Define Numerical Differentiation. Find the first and second derivatives of the function tabulated below, at the point  $x = 3.0$ . 1+6=7

$x$	3.0	3.2	3.4	3.6	3.8	4.0
$y$	-14.00	-10.032	-5.296	0.256	6.672	14.000

- (b) Derive Taylor's Series method. 7

- (c) Using Taylor's method, solve  $\frac{dy}{dx} = 1 + xy$  with  $y_0 = 2$ . 6

Find  $y(0.1)$ ,  $y(0.2)$  and  $y(0.3)$ .

5. (a) Derive Factorization Method for the system of linear equations. 10

- (b) Solve the following system of equation by Factorization method : 10

$$x + 5y + z = 21$$

$$2x + y + 3z = 20$$

$$3x + y + 4z = 26$$

6. (a) Define Extrapolation. 2

- (b) Derive Newton-Rapson method. 6

- (c) Find the root of  $x^3 - 3x - 5 = 0$  by Newton-Rapson method correct up to four decimal places. 6

- (d) Find the cube root of 10 by Newton's iterative formula. 6