JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/ CSE/ PCC-CS302/ 2023-24
2024
DATA STRUCTURE & ALGORITHMS

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. What is Asymptotic notation? State the utility of asymptotic notation in Data structure.
2. What are the disadvantages of linked list over array data structure?
3. If a Post-order traversal of a binary tree is given, is it possible to construct a unique binary tree? Justify your answer.
4. Describe the advantages of quadratic probing over linear probing for developing hashing technique.
5. Difference between AVL tree and Binary Search Tree.

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***four*** questions 4x15 = 60

6. i) Derive the height of a complete binary tree having n nodes. 4
   ii) Derive the average case time complexity for Quick Sort. 6
   iii) What is collision in hashing? How can you resolve it? 5

7. i) Construct a BST and AVL tree with the following dataset: 121, 189, 69, 26, 54, 41, 100, 227. 8
   ii) What is the problem of static linear queue? How to overcome it? 4
   iii) Derive the time complexity of insertion operation in linked list. 3

8. i) Write the reverse print operation of linked list. Explain the flow of control of the reverse print operation of linked list with the help of Tree Diagram. 6
   ii) Prove that all log function grows in the same fashion in terms of Big Oh (O) notation 4
   iii) Write an algorithm for matrix addition of two $n \times n$ matrices. Derive time complexity function of it and determine its big Oh. 5

9. i) Write an algorithm for modified bubble sort and derive the best case and worst case time complexity in terms of Big Oh. 6
   ii) Give some examples of comparison-based sorting algorithm and non-comparison-based sorting algorithm. 2
   iii) Implement push and pop operation function of a stack using array. 4
   iv) What is the overflow and empty condition of linear queue and circular queue? 3

10. i) Define priority queue. State it's application. 3
    ii) Write the binary search algorithm in recursive way. State the limitations of binary search algorithm. Derive the time complexity of this algorithm.. 7
    iii) Show each pass of Radix sort algorithm on the given list of elements: 234, 8, 176, 36, 371, 18, 189 5

11. i) Write the algorithm to convert Infix expression into an equivalent Postfix expression. 6
    ii) Write algorithms for the following functions on linear queue. 6
        a) Insertion
        b) Deletion
        c) Display
    iii) Define Graph and then define Tree using Graph. 3

12. i) Write the algorithms for inorder, preorder and postorder traversal of Binary tree 6
ii) Write the Algorithm of Tower of Hanoi problem? Discuss its time complexity. 5
iii) Is it possible to apply Binary search algorithm in a given sorted linked list? Justify your answer. 4

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH/ CSE/HSMC -301/ 2023-24

2023

Full Marks: 70

ECONOMICS FOR ENGINEERS

Times:3Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. What is fixed cost ? 2
2. What is accountancy ? 2
3. What is ratio analysis ? 2
4. What is depreciation ? 2
5. What is cash flow ? 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***four*** questions 4 X 15 =60

6. What is economic decision making ?Write role of engineers in economic decision making process? What problems arise in economic decision making process ? Write steps in economic decision making process ? 3+4+4+4

7. What is estimation in engineering economics ?Write advantages and difficulties in estimation ? Discuss per unit cost and revenue estimation model with example. 3+4+8

8. Write importance and limitation of ratio analysis .What is objective of accounting ? Write function and limitation of accounting. 5+5+5

9. What are the principle method of charging depreciation ?What is inflation ?Write effects of inflation. Write causes of inflation. 5+2+4+4

10. Write short note on – BEP, Quick ratio, Sunk cost , Operating ratio, Life-cycle Cost, Gross profit ratio, Book cost ,Stock turnover ratio, Margin of safety, Average cost. 1.5×10

11. What is the importance of project appraisal ? Write inflationary effects on project appraisal . Write effects of inflation on depreciable projects. Write limitation of cash flow. 4+4+3+4

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/ CSE/BS-CH301/ 2023-24
2023

BIOLOGY FOR ENGINEERS

Times: 3 Hours

Full Marks: 70

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A

[OBJECTIVE TYPE QUESTIONS]

[5X2=10]

Answer ***all*** questions

1. Write two examples of sulphur-containing amino acids.
2. What do you mean by endothermic reaction?
3. What do you mean by gene?
4. What is an amino acid?
5. What is coccus?

GROUP-B

[LONG ANSWER TYPE QUESTIONS]

[15X4=60]

Answer any ***four*** questions

6. Describe the ultramicroscopic structure of animal cells with a suitable diagram. (10+5=15)
7. Describe the various stages of mitosis cell division. Describe the monohybrid cross of Mendel. (15)
8. Describe different classes of proteins with suitable examples. Discuss their structures and functions. (9+6=15)
9. Write the characteristics of the enzyme. Write the role of temperature, pH, and substrate on enzyme action. (10+5=15)
10. Describe the various types of microbial culture medium. Describe the microbial growth curve with a suitable diagram. (10+5=15)
11. Classify various types of amino acids. How is a peptide bond formed?

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
COE/B.TECH./CSE/PCC-CS301/2023-24
2023
COMPUTER ORGANIZATION

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are requested to write their answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. Differentiate between memory-mapped IO and isolated IO.
2. What is little endian and big endian? Give examples.
3. Add $(-15)_{10}$ and $(-1)_{10}$ by signed 2's complement addition.
4. Give some bit patterns of multiplier where Booth's method is a) not faster than traditional method of multiplication b) faster than the traditional multiplication method?
5. Write the advantage and disadvantage of set associative mapping over direct mapping.

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***four*** questions 4x15=60

6. i) With a wheel/clock like diagram show all signed 2's complement 3bit binary numbers and its decimal equivalent 3
   ii) a) Convert $(-7.6875)_{10}$ into IEEE single precision format.
   b) Convert the IEEE single precision floating point number 0101 0111 0110 0000 0000 0000 0000 0000 into decimal number. 6
   iii) Suppose in a 8 bit floating point representation, there are 4 exponent bits and 3 fraction bits. Show the representable de-normalized and normalized range of values. 6

7. i) Multiply $(-13)_{10}$ [as Multiplicand] by $(-18)_{10}$ [as Multiplier] using Booth's algorithm explaining each step. Compare efficiency of Booth's algorithm with conventional multiplication algorithm? 7+2
   ii) Draw the circuit diagram of a full subtractor preferably using two half subtractors. Explain the concept of $Borrow_{in}$ and $Borrow_{out}$ with suitable examples. 6

8. i) State Some properties of Instruction Set Architecture. 3
   ii) With a diagram show how ALU and all the registers (like MDR, MAR, IR etc.) are interconnected inside a processor and also describe data movements when instruction fetch/execution takes place. 6
   iii) Using restoring division method divide 22 by 3 and explain each step. 6

9. i) Draw the block diagram of an adder which can add two single digit BCD numbers and explain the working mechanism. 5
   ii) Apply non restoring division method to divide 21 by 6. Clearly explain each step. 6
   iii) Design 4-bit binary Adder-Subtractor composite unit and explain with sample numbers. 4

10. i) Subtract $(1111)_2$ from $(10100)_2$ without using 2's complement technique and show the borrow bits clearly with explanation. 4

ii) Describe the working mechanism of Direct Memory Access(DMA) device with an example. 5

iii) With a suitable diagram explain working principle of set associative mapping technique. 6

11. i) Design a 4-to-16 decoder using only 2-to-4 decoders. 4

ii) Draw an organization of a MODERN memory circuit of a 1K x 1 memory chip having 32 x 32 memory cell array and using 5-to-32 decoder, 32-to-1 multiplexer also explain the mechanism. 6

iii) Consider a high level language expression X = (A+B)*C, Convert this expression into 3 set of assembly language like instructions each for stack based, accumulator based and general purpose register based CPU organization. 5

12. i) A direct mapped cache consists of 64 lines. Main memory contains 4K blocks of 128 words each. Split the main memory address into tag, block and word offset. 5

ii) Consider a memory system that uses 32-bit to address at the byte level, plus a cache that uses a line size of 64 bytes. 10

a) Assume an associative cache. Show the various parts of address format and determine the following parameters: number of addressable units, number of block in main memory size of tag.

b) Assume a 4-way set associative cache with 9 bit tag field in the address and determine the following parameters: number of lines in the cache, number of bits in the set field of the address.

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/ CSE/MC-301 / 2022-23
2023
ESSENCE OF TRADITIONAL KNOWLEDGE

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions 5x2=10

1. Define Philosophy
2. What is civilization?
3. What do you mean by Upanishads?
4. Define Culture
5. What are the four types of Vedas?

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *five/ four* questions 4x15 = 60

6. (a) Give a detailed description of Indian Philosophy? 10
   (b) What is the difference between custom and tradition? 5

7. (a) Why culture is important? 5
   (b) What are the two types of Culture? 5
   (c) Give a brief account of Culture and its characteristics? 5

8. (a) Elucidate in detail the literature of North Indian Languages? 8
   (b) Write a note on the role or significance of Sanskrit Literature and language? 7

9. Write a short note on
   (a) Hinduism 5
   (b) Jainism 5
   (c) Vows 5

10. (a) Define four noble truths 5
    (b) Define Ajivika 5
    (c) Explain Ajnana 5

11. (a) Write a note on Indian Science & Technology Heritage 8
    (b) What do you understand by the term human creative skills? 7

12. (a) Explain education in ancient India 5
    (b) What is value based education? 5
    (c) Explain the idea of zero 5

Jalpaiguri Govt. Engg. College
(A Govt. Autonomous College)
COE/B.TECH/CSE/ESC-301/2023-24
2023
DIGITAL ELECTRONICS

FM: 70 Time Allotted: 3 hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group – A

Answer **all** questions 5 X 2 = 10

1. Using 2's complement methods perform M-N with given binary numbers. M=1110100 and N=1010111.
2. Implement a 2-input XOR gate using minimum number of 2-input NAND gates.
3. Minimize the following Boolean function using K-Map:
   F(A, B, C, D) = Σm(0, 1, 3, 5, 7, 8, 9, 11, 13, 15)
4. Convert decimal number 0.7575 to binary.
5. Simplify the expression $\{(M + N')(M' + N)\}'$ using DeMorgan's theorems.

Group – B

Answer any **four** of the following 4 X 15 = 60

6. a. What is Don't Care condition? What are the advantages and disadvantages of Karnaugh map/
   b. How can AND-OR circuit be converted to NAND logic?
   c. Using k-map, simplify the following expressions:
      i) F(A,B,C,D) = Σm(1,3,4,6,9,11,13,15)+d(0,2,14)
      ii) F(A,B,C,D)=Σm(0,1,2,4,5,7,11,15).

   (1+4) + 5 + 5

7. a. What are the differences between combinational and sequential logic circuits?
   b. How can a decoder be used as demultiplexer? Explain
   c. Use a 8:1 MUX to generate the function, f(A,B,C,D)=∑m(0, 1, 3, 5, 13,.14, 15).

   4+4+7

8. a. What is latch? How a latch is different from flip flop?
   b. Perform the conversion from SR F/F to JK F/F. Discuss the conversion procedure.
   c. Data 0101 is entered into 4 bit serial in parallel out shift register. Draw a diagram to show the states of registers after 1, 2, 3, 4 clock pulses.

   4+6+5

9. a. What is race around condition in flip flop?
   b. Draw and explain 4-bit Parallel in Serial out Shift Register
   c. Draw and explain the circuit for 3 bit controlled-buffer register.

   4+7+4

10. a. Using De Morgan's theorem simplify the expression:
    $Y=XY + \overline{XZ} + X\overline{Y}Z(XY +Z)$
    b. Design and explain Look Ahead Carry generator.
    c. A logic circuit has four inputs. The output is high only when three and only three inputs are high. Design the logic circuit.

    5+5+5

P.T.O

11. a. Design a full Adder using 4:1 multiplexer and explain it.
    b. Show how a full adder can be converted to a full Subtractor with the addition of one inverter circuit.
    c. Draw the circuit diagram of adder-subtractor composite unit and explain its function

(5+5+5)

12. a. Draw and explain 4-bit up-down synchronous counter and explain its working.
    b. A 4-bit synchronous counter uses flip-flops with propagation delay of 15 ms each. What is the maximum possible time required to change the state of the counter? If the counter would be asynchronous then what would be the maximum possible time to change state?
    c. Can a shift register be used as a counter? Explain.

7+4+4

.....END.....