JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/ CSE/ BS-CH301/ 2024-25
2025
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 about Chargaff rule.
2. What do you mean by amino acid pool?
3. Differentiate between the exergonic and endergonic reaction?
4. What is Keq?
5. Write about two characteristics of genetic code?

GROUP-B

[LONG ANSWER TYPE QUESTIONS]

[15X4=60]

Answer any *four* questions

1. Describe the ultramicroscopic structure of plant cells with a suitable diagram. (15)
2. Describe about the dihybrid cross experiment of Mendel along with a suitable illustration. (15)
3. Describe the classification of carbohydrates with the suitable examples. (15)
4. Describe three physical and three chemical properties of protein. Write about the various types of enzyme inhibition along with the suitable graphs. (6+9=15)
5. Describe the various processes of sterilization. Describe about multiple allele with respect to the human blood group. (10+5=15)
6. Classify various types of lipids. Write about the characteristics features of RNA with the help of suitable diagram? (10+5=15)

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/ CSE/HSMC -301/ 2024-25
2024
ECONOMICS FOR ENGINEERS

Time: 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. What is contribution? — 2
2. What is current ratio? — 2
3. What is sunk cost? — 2
4. What is inflation? — 2
5. What is accountancy? — 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

4x15 =60

Answer any *four* questions:

6. What is fixed cost and variable cost? What are the objectives of accountancy? What problems do arise in the economic decision-making process? Write the steps in the economic decision-making process.

3+4+4+4

7. Write a brief note on the stock turnover ratio, fixed asset turnover ratio, operating ratio, net profit ratio, and quick ratio. Discuss per unit cost and revenue estimation model with examples.

10+5

8. Write a brief note on different types of costs. What is the objective of cash flow? Write the importance of project appraisal.

5+5+5

9. Is depreciation a charge against profit or an appropriation of profit? Discuss. Distinguish between the straight-line method and diminishing balance method depreciation. Write the principal method of charging depreciation.

5+5+5

10. What is ratio analysis? Write the limitation of ratio analysis. Write the classification of the accounting ratio. Write the difference between gross profit and net profit.

3+5+4+3

11. What is budget? Write the importance of performance budgeting. What are the limitations of cash flow analysis? What are the meanings of financial statements and financial analysis?

3+3+4+5

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JGEC/B.TECH/CSE/ PCC-CS302/2024-25
2024
Data Structure & Algorithms

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. Define ADT with suitable example. [2]
2. State the utility of asymptotic notation in data structure. [2]
3. What is the difference between tree and graph data structure? [2]
4. Define linear and nonlinear data structure. [2]
5. What do you mean by sparse matrix? [2]

GROUP-B
[LONG ANSWER TYPE QUESTIONS]
12x5 / 4x15 = 60

Answer any *four* questions

6. i) Consider a two-dimensional array **arr[5][12]** , where the array has base address 1010 and the number of bytes per element of array is 4. Find out the address of **arr[3][6]** in row major order as well as column major order. [4]
   ii) Explain different types of asymptotic notations with suitable examples. [6]
   iii) If $P(n)=a_0 + a_1n + a_2n^2 + a_3n^3 + \ldots\ldots + a_mn^m$ then prove that $P(n)=O(n^m)$. [5]

7. i) Write an algorithm for quick sort and derive the best and worst case time complexity in terms of Big Oh notation. [7]
   ii) What are the advantages and disadvantages of array data structure over linked list? [3]
   iii) Implement push and pop operation of dynamic stack. [5]

8. i) What are the limitations of infix expression? Convert the following infix expression **Q** to equivalent postfix expression using stack (Show all the steps). [6]
   Q: A + (B * C - (D / E ^ F) * G) * H
   ii) Write algorithms for the following operations on circular queue. [6]
       a) Insertion
       b) Deletion
   iii) Write an algorithm to reverse a linked list. [3]

9. i) Write in-order, pre-order and post order traversal algorithms of a binary tree. [6]
   ii) Suppose the following list of letters is inserted in order into an empty binary search tree **T**:
       J , R , D , G , T , E , M , H , P , A , F , Q
   Find the final tree **T** and find the in-order traversal of **T** [6]
   iii) Suppose the following sequences generate the nodes of a binary tree **T** in pre-order and in-order respectively:
       Pre-order: G , B , Q , A , C , K , F , P , D , E , R , H
       In-order: Q , B , K , C , F , A , G , P , E , D , H , R
   Draw the diagram of the tree **T**. [3]

10. i) Write an efficient algorithm to delete a node from a binary search tree. [6]
    ii) How is an AVL search tree better than a binary search tree? Create an AVL search tree using the following sequence of data: [5]
        16 , 27 , 9 , 11 , 36 , 54 , 81 , 63 , 72
    iii) Write an algorithm to implement binary search technique and mention its time complexity in different cases. [4]

11. i) Write an algorithm to implement the merge sort and derive its time complexity. [6]
    ii) Create a B tree of order 5 by inserting the following elements:
        3 , 14 , 7 , 1 , 8 , 5 , 11 , 17 , 13 , 6 , 23 , 12 , 20 , 26 , 4 , 16 , 18 , 24 , 25 and 19 [5]
    iii) What is collision? Explain various techniques to resolve a collision. [4]

12. i) Write efficient algorithms to insert a node at first position in a circular linked list as well as delete the first [6]
    node from circular linked list.
    ii) Show each pass of radix sort algorithm on the given list of elements: [5]
        348 , 143, 361, 432, 538 , 28 , 321 , 543 , 6
    iii) What do you mean by binary heap? Create a min heap with the following sequence of data: [4]
        50 , 40 , 35 , 25 , 20 , 27 , 33

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. What is overflow in two's complement addition and how is it detected?
2. If the clock rate of the processor and number of actual machine language instructions of a program are Given, then the time to execute that program depends on which parameter and how?
3. In Intel IA 32 architecture,
   a) How many bits are used for addressing a byte in memory?
   b) What are the two possible sizes of a data operand?
4. What is low-order memory interleaving and what is its advantage?
5. Write an expression for average memory access time in a single level cache memory system.

GROUP-B
[LONG ANSWER TYPE QUESTIONS]   4x15=60

Answer any *four* questions

6. i) Perform $(-32) - (15)$ using 2's complement method.   4
   ii) Write an algorithm/flowchart for Restoring method of division.   4
   iii) Explain the steps in non-restoring method of division when 14 are divided by 6.   7

7. i) What is Booth's recoded form? Show different ways to find decimal equivalent of the number (1101011010) converting using 2's complement form and Booth's recoded form side by side.   4
   ii) Describe how PC, MAR, MDR, IR and ALU interact when a program is being executed.   4
   iii) Multiply multiplicand $(-12)_{10}$ by multiplier $(-13)_{10}$ using Booth's algorithm clearly explaining each step.   7

8. i) a) Convert $(-13.6875)_{10}$ into IEEE single precision format.   (4+3)
      b) Convert the IEEE single precision floating point number 0111 1101 0010 1000 0000 0000 0000 0000 into equivalent decimal number.
   ii) Consider a 9 bit floating point representation based on IEEE floating point format with 1 sign bit, 4 exponent bits, and 4 fractional bits. Show the representable range of normalized and de-normalized numbers (also express each binary value in equivalent decimal value).   8

9. i) Describe direct mapping mechanism in cache memory system.   4
   ii) Explain the two principles 'temporal locality' and 'spatial locality' with examples.   5
   iii) A four way set associative cache consists of 64 lines. Main memory contains 4K blocks of 128 bytes each. Split the main memory address into tag, set and word offset   6

10. i) A processor advertised as having 900-MHz clock does not necessarily provide better performance than 700 MHz processor. How can it be possible?   5

ii) Build a 256MB RAM using only 4MB basic chips following low-order memory interleaving. Draw the circuit diagram.   5

iii) Build a 4MB (megabyte) with eight 4Mb (megabit) chips. Also show how individual 4Mb chip can be built by organizing bits in two dimensional array and only two decoders for addressing a single bit.   5

11. i) Explain little-endian and big-endian system with examples. ᒐ ᒐ ᒐ   3   2

ii) Explain the role of each field of the following Intel IA-32 instruction encoding format with suitable examples.   5

Opcode	ModR/M	SIB	Displacement	Immediate

iii) Describe only 6 different addressing modes the Intel IA-32 architecture follows with suitable examples.   7

12. i) Describe the working principles of 4-stage pipelined processor having inter-stage buffer with suitable diagram.   4

ii) Explain with diagram and examples how three different types of hazards may affect pipeline performance.   5

iii) Consider a two-level cache hierarchy L1 and L2 caches. An application incurs 1.3 memory accesses per instruction on average. For this application, the miss rate of L1 cache 0.08, the L2 cache experience on average of 8 misses per 1000 instructions. Find the miss rate of L2 expressed correct to two decimal places.   6

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
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JGEC/COE/B.TECH./CSE/ESC301/2024-25
2025
DIGITAL ELECTRONICS

Full Marks: 70

Times: 3 Hours

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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. What is priority encoder?
2. Convert the binary $[11001101]_2$ to Gray code and Gray Code $[1000111]_G$ to binary form.
3. Write two applications of decoder.
4. What are the parameters of flip flops?
5. What is presettable counter?

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions

4 x 15=60

7. i) Explain different laws of Boolean Algebra. State the DeMorgan's theorems. — 3+2
   ii) A limited company has directors A, B, C, D holding 35%, 30%, 20%, 15% of the shares respectively. A major decision must have a support of minimum 60% of the stock. Design a combinational logic circuit for the voting in the company. — 5
   iii) Define half adder, full adder and adder-subtractor composite circuit. Design their circuits with logic gates. — 5

8. i) Differentiate between combinational logic circuits and sequential logic circuits. — 3
   ii) Draw the circuit of a serial in-serial out shift register and explain its working. Data 11010 is entered in to 5 bit serial-in serial out shift register. Show the status of registers after 1,2,3,4,5 clock pulses. — 6
   iii) Draw the block diagram and explain the working of universal shift register (USR). — 3
   iv) Explain the procedure for grouping of cells in K-map. — 3

9. i) A logic circuit has four inputs, A,B,C,D. The output should be high when A is low and exactly two other inputs are low. Prepare a truth table. Obtain output expression. Draw the circuits with AND, OR logic gates. — 5
   ii) Using Quine McCluskey tabulation method, simplify the following function. — 5
   $F(ABCD)=\sum m(0,1,2,3,5, 7,8,10,14,15)$
   iii) Simplify the following functions together with don't care condition d, express the simplified function in the sum of minterms: (i) $F(A,B,C,D)=\Sigma(0,6,8,13,14)$, $d(A,B,C,D)=\Sigma(2,4,10)$; — 5
   (ii) $F(A,B,C,D)=\Sigma(1,3,5,7,9,15)$, $d(A,B,C,D)=\Sigma(4,6,12,13)$.

10. i) What is race around condition? Draw logic diagram (showing all gates) of a master-slave flip-flop using NAND gates only and explain the working principle. — 7
    ii) What is excitation table? State the excitation table of SR, JK, D flip flops. Convert a SR flip flop into D flip flop. — 8

11. i) Implement the following function with an 8 to 1 multiplexer. (A=S2, B=S1, D=S0) — 5
    $F(A, B, C, D) = \sum(0, 2, 4, 6, 7, 8,9, 10, 12, 13, 15)$
    ii) A combinational circuit is defined by the following three functions: — 5
    $F1=x'y + xyz'$; $F2=x + yz'$ $F3 = xy + x'y'$
    Design the circuit with a decoder and external gates.
    iii) Design a combinational circuit that accepts a three-bit number (X) and generates an output binary number (Y) where $Y=X^2+1$. Assume, Y is a binary number of 6 bits. — 5

12. i) Differentiate between a) asynchronous and synchronous counters, b) Ring and Johnson counter. 5
   ii) How many flip-flops and AND gates are needed for Mod-64 synchronous counter? 5
   iii) Find the maximum frequency of ripple counter having (a) 4 bits (b) 6 bits. Assume t_{pd} of each flip flop 5
   as 50 ns.

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/CSE/MC 301/ 2024-25
2024
ESSENCE OF TRADITIONAL KNOWLEDGE

Full Marks: 70   Time: 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 are the four Vedas?   2
2. Which language is the root of all Indian languages?   2
3. Who is known as the father of Ayurveda?   2
4. Which ancient Indian text is considered the foundation of Yoga philosophy?   2
5. Which Indian mathematician is credited with the invention of the concept of zero?   2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions: 4x15 = 60

6. Explain the scope and importance of Traditional Knowledge.

7. Write about the significance of Traditional Knowledge protection.

8. Discuss the historical development and significance of Ayurveda as a traditional system of medicine in India.

9. Discuss the new trends in the Indian Traditional Knowledge system, its growth and developmental activities.

10. Examine the role of youth and administrators in promoting Traditional Knowledge protection in India.

11. Discuss the importance of Indian Tradition in the field of Engineering and Technology.

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