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17CS/IS32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Analog & Digital Electronics

Time: 3 hrs. Max. Marks: 100

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the construction and operation principle of N-channel JFET along with its characteristic curves. **(08 Marks)**

b. The Fig. Q1 (b) shows a biasing configuration using DE-MOSFET. Given that the saturation Drain current is 8 mA and the pinch off voltage is -2 V; determine the value of Gate, source voltage, Drain current and the drain source voltage. **(06 Marks)**

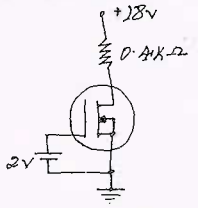

Fig. Q1 (b)

c. With neat figure and relevant waveforms, explain the working of relaxation oscillator circuit using op-amp. **(06 Marks)**

OR

2 a. Explain the working of an Astable multivibrator with necessary diagrams and expressions for frequency of oscillation, using timer IC 555. **(08 Marks)**

b. Differentiate between JFETs and MOSFETs. **(05 Marks)**

c. With neat figure, explain the operation of Peak Detector Circuit using op-amp. **(07 Marks)**

Module-2

3 a. Discuss positive and negative logic and list equivalences in positive and negative logic. **(04 Marks)**

b. A digital system is to be designed in which the months of the year is given as input in four bit form. The month January is represented as '0000', February as '0001' and so on. The output of the system should be '1' corresponding to the input of the month containing 31 days or otherwise it is '0'. Consider excess numbers in the input beyond '1011' as don't care conditions. For this system of four variables (A, B, C, D) find the following:

(i) Boolean expression in $\sum$m and $\prod$M form.

(ii) Using K-map simplify in SOP form.

(iii) Implement using NAND-NAND gates. **(08 Marks)**

c. Simplify, using QM method: $F(A,B,C,D) = \sum m(1,2,8,10,11,14,15)$ **(08 Marks)**

OR

4 a. What are static hazards? How to design a hazard free circuit? Explain with an example. **(08 Marks)**

b. Write a verilog code for the Fig. Q4 (b) in, (i) Structural model (ii) Dataflow model and (iii) Behavioural model. **(08 Marks)**

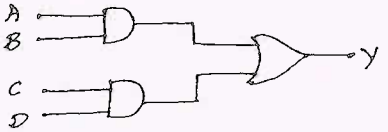

Fig. Q4 (b)

c. Prove that duty cycle of a symmetrical waveform is 50%. An asymmetrical signal waveform is high for 2 ms and low for 3 ms. Find period, frequency and duty cycle high. **(04 Marks)**

Module-3

5 a. Implement $Y(A,B,C,D) = \sum m(0,2,3,4,5,8,9,10,11,12,13,15)$ using 8 to 1 multiplexer. **(06 Marks)**

b. What is magnitude comparator? Write the truth table and logic circuit of a 1 bit comparator. **(06 Marks)**

c. What are different types of PLDs? Implement the 7 segment decoder using PLA. **(08 Marks)**

OR

6 a. Design a priority encoder for a system with three inputs; the middle bit with highest priority encoding to 10, the MSB with next priority encoding to 11, while the LSB with least priority encoding to 01. **(08 Marks)**

b. Write a verilog code for a A-to-1 multiplexer using conditional assignment statement. **(06 Marks)**

c. Differentiate combinational and sequential circuits. **(06 Marks)**

Module-4

7 a. With block diagram, truth table and waveforms, explain the working of Master-Slave JK Flip-Flop. **(07 Marks)**

b. Name and explain in short the four basic types of shift registers and draw a block diagram for each. **(08 Marks)**

c. Bring out the differences between asynchronous and synchronous counters. **(05 Marks)**

OR

8 a. What is switch contact bounce? How to remove any contact bounce due to switch using SR latch. **(08 Marks)**

b. How long it will take to shift the hexadecimal number 'AB' into 54/74164 (SIPO), if the clock is 5 MHz? **(02 Marks)**

c. Explain 4-bit sequence generator and programmable 4-bit sequence detector. **(10 Marks)**

Module-5

9 a. What do you mean by lockout condition in counters? Using JK flip-flops design self correcting mod-6 counter. **(10 Marks)**

b. What is accuracy and resolution of the D/A converter? Explain with example. What is the resolution of a 9-bit D/A converter which uses a ladder network? If the full-scale output voltage of this converter is +5 V, what is resolution in volts? **(10 Marks)**

OR

10 a. Discuss two drawbacks of resistive divider used in converting digital input to analog output. Draw the schematic for a 4-bit binary ladder and explain how digital to analog conversion is achieved using it. **(10 Marks)**

b. Explain the concept of 'successive approximation' of A/D converter. **(10 Marks)**

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15CS34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Computer Organization

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With a neat diagram, explain the connection between processor and memory. **(08 Marks)**

b. Explain: (i) Processor clock (ii) Clock rate
(iii) Basic performance equation (iv) Performance measurement **(08 Marks)**

OR

2 a. List the addressing modes with assemble syntax and addressing functions. **(08 Marks)**

b. Explain basic input output operation. Write a program to read a line of character and display it. **(08 Marks)**

Module-2

3 a. Explain the interrupts with hardware. Write the steps in enabling and disabling interrupts. **(08 Marks)**

b. Explain the issues in handling the multiple devices in interrupts. **(08 Marks)**

OR

4 a. With a neat diagram, explain DMA and different types of bus arbitrations. **(08 Marks)**

b. Explain USB tree structure and protocols. **(08 Marks)**

Module-3

5 a. Draw the internal organization of a 2M × 8 dynamic memory chip. Explain fast page mode. **(08 Marks)**

b. Explain the mapping functions used in cache memory. **(08 Marks)**

OR

6 a. What is memory interleaving? Explain with example. **(08 Marks)**

b. What is virtual memory? Explain the address translation. **(08 Marks)**

Module-4

7 a. Design 4-bit carry look ahead adder and explain. **(08 Marks)**

b. Explain Booth recoding of a multiplier. Perform (+13) × (−6) using Booths algorithm. **(08 Marks)**

OR

8 a. Explain logic and circuit arrangement for implementing restoring division. **(08 Marks)**

b. Write the rules for arithmetic operations on floating point operations. **(08 Marks)**

Module-5

9 a. With a neat diagram, explain single bus organization of data path inside the processor. **(08 Marks)**

b. Write actions required and control sequence for execution of instruction ADD (R_3), R_1. **(08 Marks)**

OR

10 a. Briefly explain the block diagram of microwave oven. **(08 Marks)**

b. Explain the different possible ways of implementing a multiprocessor system. **(08 Marks)**

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17CS/IS34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Computer Organization

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With a neat block diagram discuss the basic operational concept of a computer. **(08 Marks)**

b. What is performance measurement? Explain overall SPEC rating for computer. **(06 Marks)**

c. Explain Big-Endian, Little-Endian and assignment byte addressability. **(06 Marks)**

OR

2 a. What is an addressing mode? Explain any three addressing modes with example. **(08 Marks)**

b. Draw single bus structure, discuss about memory mapped I/O. **(06 Marks)**

c. What is stack and queue? Write the line of code to implement the same. **(06 Marks)**

Module-2

3 a. Define bus arbitration. Briefly explain the two approaches of bus arbitration. **(10 Marks)**

b. Explain the following with respect to USB: i) USB Architecture ii) USB Protocols. **(10 Marks)**

OR

4 a. With a neat block diagram, explain the general 8 bit parallel processing. **(08 Marks)**

b. With a block diagram, explain how the keyboard interfaced to processor. **(06 Marks)**

c. Explain PCI bus. **(06 Marks)**

Module-3

5 a. What is 'Locality of Reference'? Explain Direct mapping technique and set-associative mapping technique. **(10 Marks)**

b. What is asynchronous DRAM? With a neat diagram explain the internal organization of a $2M \times 8$ dynamic memory chip. **(10 Marks)**

OR

6 a. What is virtual memory? With a diagram explain how virtual memory address translation take place. **(10 Marks)**

b. Write a note on:
i) Magnetic disk principles
ii) Magnetic tape system. **(10 Marks)**

Module-4

7 a. Explain with a neat block diagram, 4-bit carry look ahead adder. **(08 Marks)**

b. Perform following operations on the 5-bit signed numbers using 2's complement representation system. Also indicate whether overflow has occurred.
i) (-9) + (-7) ii) (+7) – (-8). **(04 Marks)**

c. Explain the concept of carry save addition for the multiplication operations. $M \times Q = P$ for 4-bit operands with diagram and suitable example. **(08 Marks)**

OR

8 a. With a neat diagram, explain IEEE standard for floating point numbers. **(06 Marks)**

b. Perform multiplication for -13 and +09 using Booth's Algorithm. **(06 Marks)**

c. With a neat block diagram, explain circuit arrangement for binary division. **(08 Marks)**

Module-5

9 a. What is pipelining? Explain the basic concept of pipeline performance with neat sketch. **(08 Marks)**

b. Explain with neat diagram, micro-programmed control method for design of control unit and write the micro-routine for the instruction branch < 0. **(08 Marks)**

c. Differentiate between hardwired and micro programmed control unit. **(04 Marks)**

OR

10 a. Briefly explain the block diagram of camera. **(10 Marks)**

b. With a neat diagram, explain the structure of general purpose multiprocessors. **(10 Marks)**

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17CS/IS36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define tautology and contradiction. Prove that for any propositions p, q, r the compound proposition $\{p \wedge (p \wedge r) \rightarrow s\} \rightarrow (r \rightarrow s)$ is tautology. **(06 Marks)**

b. Establish the validity of the argument: If A get the superwiser's position and work hard, then he will get raise.
If he gets a raise, then he will buy a new car.
He has not bought a new car.
Therefore, he does not get a superwiser's position or he did not work hard. **(07 Marks)**

c. Determine the truth value of each of the following quantified statements; if the universe being the set of all non-zero integers.
i) $\exists x, \exists y [xy = 2]$
ii) $\exists x, \forall y [xy = 2]$
iii) $\forall x, \exists y [xy = 2]$
iv) $\exists x, \exists y, [(3x + y = 8) \wedge (2x - y = 7)]$
v) $\exists x, \exists y [(4x + 2y = 3) \wedge (x - y = 1)]$ **(07 Marks)**

OR

2 a. Define dual of a logical statement and prove the logical equivalence using laws of logic $[(\neg p \vee q) \wedge (p \wedge (p \wedge q))] \Leftrightarrow p \wedge q$ **(06 Marks)**

b. Establish the validity of the argument : All Engineering students study physics. All engineering students of computer science study logic.
Ravi is an engineering student who does not study logic
Sachin studies logic but does not study physics.
Therefore, Ravi is not a student of computer science and Sachin is not an engineering student. **(07 Marks)**

c. Give: i) Direct proof ii) Indirect proof and "If n is an odd integer, then n + 7 is an even integer". **(07 Marks)**

Module-2

3 a. Prove that every positive integer greater than or equal to 14 may be written as sum of 3's and /or 8's. **(06 Marks)**

b. Find the number of arrangements of all the letters in TALLAHASSEE. How many of these arrangements have no adjacent A's? **(07 Marks)**

c. In how many ways can one distribute eight identical balls into four distinct containers so that i) No container is left empty ii) the fourth container gets an odd number of balls. **(07 Marks)**

OR

4 a. If $L_0, L_1, L_2 \ldots\ldots$ are Lucas numbers, then prove that $L_n = \left(\frac{1+\sqrt{5}}{2}\right)^n + \left(\frac{1-\sqrt{5}}{2}\right)^n$. **(06 Marks)**

b. A question paper contains 10 questions of which 7 are to be answered. In how many ways a student can select the 7 questions
   i) If he can choose any seven?
   ii) If he should select three questions from first five and four questions from the last five?
   iii) If he should select at least three from the first five? **(07 Marks)**

c. Find the coefficient of $x^2y^2z^3$ and the number of distinct terms in the expansion of $(3x - 2y - 4z)^7$. **(07 Marks)**

Module-3

5 a. If f: R $\rightarrow$ R is defined by $f(x) = x^2 + 5$, find f(-1); f(2/3); $f^{-1}(1)$; $f^{-1}([6, 10])$; $f^{-1}([-4, 5])$; $f^{-1}([-4, 5])$. **(06 Marks)**

b. State Pigeonhole principle. ABC is an equilateral triangle whose sides are of length 3cm each. If we select 10 points inside the triangle, prove that at least two of these points are such that the distance between them is less than 1cm. **(07 Marks)**

c. Let A = {1, 2, 3, 4, 5}. Define a relation R on A $\times$ A by (x_1, y_1) R(x_2, y_2) if and one if $x_1 + y_1 = x_2 + y_2$. Then verify that R is an equivalence relation on A $\times$ A and hence find the equivalence classes [(1, 3)], [(2, 4)] and [(1, 1)]. **(07 Marks)**

OR

6 a. Let A = B = R, the set of all real numbers, and the functions f : A $\rightarrow$ B and g : B $\rightarrow$ A be defined by $f(x) = 2x^3 - 1, \forall x \in A$; $g(y) = \left\{\frac{1}{2}(y+1)\right\}^{1/3}, \forall y \in B$. Show that each of f and g is the inverse of the other. **(06 Marks)**

b. Define one-to-one function and on to function. Determine in each of the following cases where f is one-to-one or onto or both or neither [f : A $\rightarrow$ B].
   i) A = B = {1, 2, 3, 4};
      f = {(1, 1), (2, 3), (3, 4), (4, 2)}
   ii) A = {a, b, c}, B = {1, 2, 3, 4}
      f = {(a, 1), (b, 1), (c, 3)}
   iii) A = {1, 2, 3}, B = {1, 2, 3, 4, 5}
      f = {(1, 1), (2, 3), (3, 4)}
   iv) A = {1, 2, 3}, B = {1, 2, 3, 4, 5}
      f = {(1, 1), (2, 3), (3, 3)}
   v) A = {1, 2, 3, 4}, B = {a, b, c, d}
      f = {(1, a) (2, a), (3, d), (4, c)} **(07 Marks)**

c. Draw Hasse diagram representing the positive divisors of 36. **(07 Marks)**

Module-4

7 a. Determine the number of positive integers n such that $1 \leq n \leq 300$ and n is not divisible by 5, 6, 8 and divisible by at least one of 5, 6, 8. **(06 Marks)**

b. Four persons P_1, P_2, P_3, P_4 who arrive late for a dinner party, find that only one chair at each of five tables T_1, T_2, T_3, T_4 and T_5 is vacant, P_1 will not sit at T_1 or T_2, P_2 will not sit at T_2, P_3 will not sit at T_3 or T_4 and P_4 will not sit at T_4 or T_5. Find the number of ways they can occupy the vacant chair. **(07 Marks)**

c. Define Homogeneous and non-homogeneous recurrence relations of first order and solve the recurrence relation $a_n - 3a_{n-1} = 5 \times 3^n$ for $n \geq 1$ given that $a_0 = 2$. **(07 Marks)**

OR

8 a. Find the number of nonnegative integer solutions of the equation $x_1 + x_2 + x_3 + x_4 = 18$ under the condition $x_i \leq 7$, for i = 1, 2, 3, 4. **(06 Marks)**

b. Define derangements and determine the rook polynomial of the board in Fig.Q.8(b) using expansion formula by selecting square 1 as ⊛ **(07 Marks)**

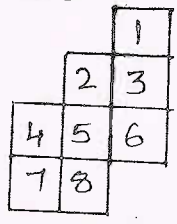

Fig.Q.8(b)

c. Solve the recurrence relation $a_n = a_{n-1} + a_{n-2}$ $a_1 = 1$, $a_2 = 3$. **(07 Marks)**

Module-5

9 a. Define complete graph and complete bipartite graph. Draw Kuratowski's first graph K_5 and second graph $K_{3,3}$ and hence find the number of edges in them. **(06 Marks)**

b. State Handshaking property. Show that $\delta \leq \frac{2m}{n} < \Delta$, for a given graph with n vertices and m edges, if δ is the minimum and Δ is the maximum of the degree of vertices. **(07 Marks)**

c. Obtain an optimal prifix code for the message MISSION SUCCESSFUL. Indicate the code and find the optimal weight. **(07 Marks)**

OR

10 a. Define circuit and Euler circuit in graphs and discuss the solution of Konigsberg bridge problem. **(06 Marks)**

b. Define isomorphism. Verify the two graphs are isomorphic in Fig.Q.10(b). **(07 Marks)**

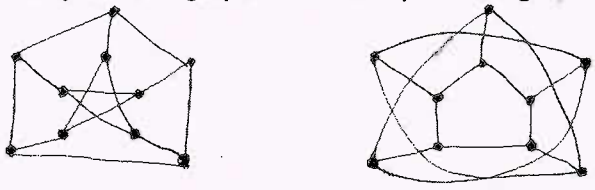

Fig.Q.10(b)

c. Define tree and show that a tree with n vertices has n – 1 edges. **(07 Marks)**

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18CS32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Data Structures and Applications

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is data structure? What are the various types of data structure? Explain. **(05 Marks)**

b. What is structure? How it is different from array? Explain different types of structure declaration with examples and give differences between Union and Structure. **(10 Marks)**

c. Define pointers. How to declare and initialize pointers, explain with example. **(05 Marks)**

OR

2 a. Explain dynamic memory allocation functions in detail. **(06 Marks)**

b. Write the Knuth Morris Pratt pattern matching algorithm and apply the same to search the pattern 'abcdabcy' in the text: 'abcxabcdabxabcdabcdabcy' **(08 Marks)**

c. Write a C program to:
(i) Comparing strings
(ii) Concatenate two strings **(06 Marks)**

Module-2

3 a. Define stack. Give the implementation of push, pop and display functions. Include check for empty and full conditions. **(07 Marks)**

b. Write the postfix form of the following expressions using stack:
(i) A $ B * C – D + E|F|(G + H)
(ii) A – B | (C * D $ E) **(06 Marks)**

c. Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression. ABC – D *+E$F + and assume A = 6, B = 3, C = 2, D = 5, E = 1 and F = 7. **(07 Marks)**

OR

4 a. Define recursion. Write a recursive functions for the following:
(i) Factorial of a number
(ii) Tower of Hanoi **(07 Marks)**

b. What is the advantage of circular queue over ordinary queue? Write a C program to simulate the working of circular queue of integers using array. Provide the following operations:
(i) Insert
(ii) Delete
(iii) Display **(08 Marks)**

c. Write a note on Dequeue and priority queue. **(05 Marks)**

Module-3

5 a. What is a linked list? Explain the different types of linked lists with neat diagram. **(07 Marks)**

b. Write a C function to insert a node at front and delete a node from the rear end in a circular linked list. **(08 Marks)**

c. Write a C function for the concatenation of two doubly linked lists. **(05 Marks)**

OR

6 a. Describe the doubly linked lists with advantages and disadvantages. Write a C function to delete a node from a circular doubly linked list with header node. **(08 Marks)**

b. For the given sparse matrix, give the diagrammatic linked representation.

$$a = \begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$ **(04 Marks)**

c. Write a C function to add two-polynomials represented as circular list with header node. **(08 Marks)**

Module-4

7 a. What is a tree? With suitable example, define:
(i) Binary tree
(ii) Level of the binary tree
(iii) Complete binary tree
(iv) Degree of the tree **(09 Marks)**

b. Write the C routines to traverse the tree using:
(i) Pre-order traversal
(ii) Post-order traversal. **(06 Marks)**

c. For the given data, draw a binary search tree and show the array and linked representation of the same: 100, 85, 45, 55, 110, 20, 70, 65. **(05 Marks)**

OR

8 a. What is the advantage of the threaded binary tree over binary tree? Explain the construction of threaded binary tree for 10, 20, 30, 40 and 50. **(07 Marks)**

b. Define expression tree. For a tree given in Fig.Q8(b) traverse the tree using in-order, preorder and post-order traversals.

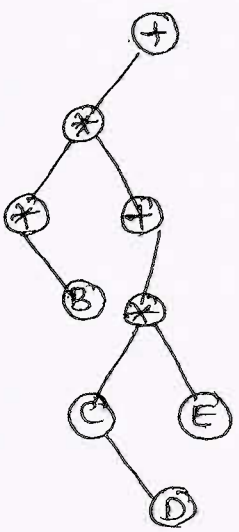

Fig.Q8(b) **(07 Marks)**

c. Construct a binary search tree by using the following in-order and preorder traversals:
Inorder : BCAEDGHFI
Preorder : ABCDEFGHI **(06 Marks)**

Module-5

9 a. Define graph. For the given graph, show the adjacency matrix and adjacency list representation of the graph [Ref. Fig.Q9(a)]

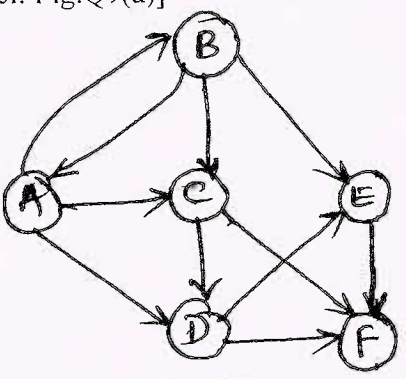

Fig.Q9(a) **(05 Marks)**

b. What are the methods used for traversing a graph? Explain any one with example and write C function for the same. **(08 Marks)**

c. Write a C function for insertion sort. Sort the following list using insertion sort:
50, 30, 10, 70, 40, 20, 60 **(07 Marks)**

OR

10 a. What is collision? What are the methods to resolve collision? Explain linear probing with an example. **(07 Marks)**

b. Explain in detail about static and dynamic hashing. **(06 Marks)**

c. Briefly explain basic operations that can be performed on a file. Explain indexed sequential file organization. **(07 Marks)**

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18CS33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Analog and Digital Electronics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the construction, working and characteristics of photo diode. **(06 Marks)**

b. With hysteresis characteristics explain the working of Schmitt trigger circuit (Inverting). **(06 Marks)**

c. With a neat circuit diagram and mathematical analysis explain voltage divider bias circuit. **(08 Marks)**

OR

2 a. Explain the working of R-2R ladder D to A converter. **(06 Marks)**

b. Explain successive approximation A to D converter. **(06 Marks)**

c. Show how IC-555 timer can be used as an astable multivibrator. **(08 Marks)**

Module-2

3 a. Find the minimum SOP and minimum POS expressions for the following function using K-map. $f(A, B, C, D) = \sum_m (1, 3, 4, 11) + \sum_d (2, 7, 8, 12, 14, 15)$. **(06 Marks)**

b. What are the disadvantages of K-map method? How they are overcome in Quine Mccluskey method. Simplify following function using Q-M method
$f(A, B, C, D) = \sum_m (0, 1, 2, 5, 6, 7, 8, 9, 10, 14)$. **(08 Marks)**

c. What is Map-Entered Variable method? Using MEV method simplify following function:
$f(A, B, C, D) = \sum_m (2, 3, 4, 5, 13, 15) + dc(8, 9, 10, 11)$. **(06 Marks)**

OR

4 a. With the help of flow chart explain how to determine minimum sum of products using Karnaugh map. **(06 Marks)**

b. Using Q-M method simplify the following function
$F(A, B, C, D) = \sum_m(2, 3, 7, 9, 11, 13) + \sum_d(1, 10, 15)$. **(08 Marks)**

c. With example explain Petrik's method. **(06 Marks)**

Module-3

5 a. What are hazards in digital circuits? Explain different types of hazards. **(06 Marks)**

b. Implement full subtractor using 3 to 8 decoder and NAND gates. **(06 Marks)**

c. Differentiate between PAL and PLA. Realize following functions using PLA. Give PLA table and internal connection diagram for the PLA (Use as many common terms as possible)
$F_1(1, b, c, d) = \sum_m(1, 2, 4, 5, 6, 8, 10, 12, 14)$
$F_2(a, b, c, d) = \sum_m(2, 4, 6, 8, 10, 11, 12, 14, 15)$ **(08 Marks)**

OR

6 a. What is Multiplexer? Implement following function using 8:1 MUX
$f(A, B, C, D) = \sum_m(1, 2, 5, 6, 9, 12)$ **(08 Marks)**

b. Design Hexadecimal (Binary) to ASCII Code Converter using suitable ROM. Give the connection diagram of ROM. **(06 Marks)**

c. Explain Simulation and testing of digital circuits. **(06 Marks)**

Module-4

7 a. Explain the structure of VHDL program. Write VHDL code for 4 bit parallel adder using full adder as component. **(08 Marks)**

b. Explain the working of SR latch using NOR gates. Show how SR latch can be used for switch debouncing. **(07 Marks)**

c. Differentiate between Latch and Flip Flop. Show how SR flipflop can be converted to D flip flop. **(05 Marks)**

OR

8 a. Derive the characteristics equations for D, T, SR and JK flipflops. **(08 Marks)**

b. Draw the logic diagram of master slave JK flipflop using NAND gates and explain the working with suitable timing diagram. **(07 Marks)**

c. With example explain the syntax of conditional signal assignment statement in VHDL. **(05 Marks)**

Module-5

9 a. What is shift register? Explain the working of 8 bit SISO shift register using SR flip flop. **(06 Marks)**

b. With the help of state graph, state and transition tables and timing diagram explain sequential parity checker. **(06 Marks)**

c. Design a random counter using T flip flops whose transition graph is shown in Fig.Q.9(c). **(08 Marks)**

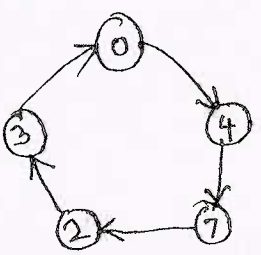

Fig.Q.9(c)

OR

10 a. What is register? Explain how 4 bit register with data, load, clear and clock input is constructed using D flip flops. **(06 Marks)**

b. With a block diagram explain the working of n-bit parallel adder with accumulator. **(06 Marks)**

c. Differentiate between Moore and Melay machines. Analyze following Moore sequential circuit for an input sequence of X = 01101 and draw the timing diagram. **(08 Marks)**

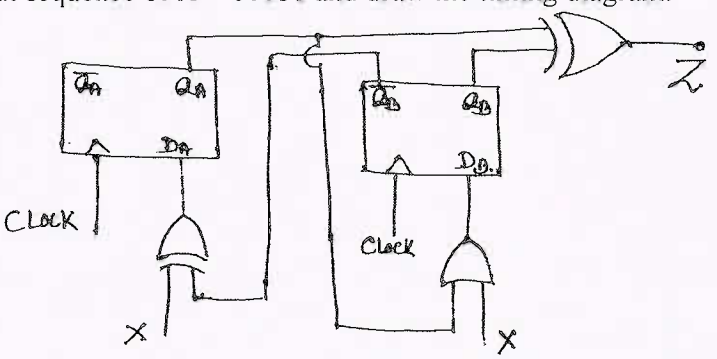

Fig.Q.10(c)

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18CS34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Computer Organization

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the basic operational concepts of the computer with a neat diagram. **(06 Marks)**

b. What is performance measurement? Explain the overall SPEC rating for the computer in a program suite. **(08 Marks)**

c. Explain the following :
(i) Byte addressability (ii) Big-endian assignment (iii) Little-endian assignment. **(06 Marks)**

OR

2 a. Show how the below expression will be executed in one address, two address and three address processors in an accumulator organization.
$X = A \times B + C \times D$ **(08 Marks)**

b. What is the effective address of the source operand in each of the following instructions, when the Register R1, and R2 of computer contain the decimal value 1200 and 4600?
(i) Load 20(R1), R5 (ii) Move #3000, R5 (iii) Store R5, 30(R1, R2)
(iv) Add – (R2), R5 (v) Subtract (R1)+, R5 **(08 Marks)**

c. Interpret the Subroutine Stack Frame with example. **(04 Marks)**

Module-2

3 a. Illustrate a program that reads one line from the keyboard, stores it in memory buffer, and echoes it back to the display in an I/O interfaces. **(10 Marks)**

b. What is an interrupt? What are Interrupt service routines and what are vectored interrupts? Explain with example. **(10 Marks)**

OR

4 a. Demonstrate the DMA and its implementation and show how the data is transferred between memory and I/O devices using DMA controller. **(08 Marks)**

b. With a neat diagram, explain the general 8-bit parallel interface circuit. **(06 Marks)**

c. Explain PCI bus data transfer in a computer system. **(06 Marks)**

Module-3

5 a. Explain the organization of 1k × 1 memory chip. **(08 Marks)**

b. With a neat figure explain the direct mapped cache in mapping functions. **(08 Marks)**

c. What is memory interleaving? Explain. **(04 Marks)**

OR

6 a. With a neat diagram briefly explain the internal organization of 2M × 8 dynamic memory chip. **(08 Marks)**

b. Illustrate cache mapping techniques. **(06 Marks)**

c. Calculate the average access time experienced by a processor, if a cache hit rate is 0.88, miss penalty is 0.015 milliseconds and cache access time is 10 microseconds. **(06 Marks)**

Module-4

7 a. Perform the addition and subtraction of signed numbers:
(i) + 4 and – 6 (ii) – 5 and – 2 (iii) + 7 and – 3 (iv) + 2 and + 3 **(08 Marks)**

b. Explain 4 bit carry - look ahead adder with a neat diagram. **(06 Marks)**

c. Perform bit pair recoding for (+13) and (– 6). **(06 Marks)**

OR

8 a. Perform Booth's algorithm for signed numbers (– 13) and (+ 11). **(10 Marks)**

b. Show and perform non restoring division for 3 and 8. **(10 Marks)**

Module-5

9 a. Illustrate the sequence of operations required to execute the following instructions
Add (R3), R1 **(10 Marks)**

b. Explain the three bus organization of a data path with a neat diagram. **(10 Marks)**

OR

10 a. Compare and contrast the following :
(i) Hard - wired control
(ii) Microprogrammed control. **(10 Marks)**

b. What is pipeline? Explain the 4 stages pipeline with its instruction execution steps and hardware organization. **(10 Marks)**

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18CS35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Software Engineering

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is Software Engineering? Explain Software Engineering Code of Ethics. **(08 Marks)**

b. What are attributes of good software? Explain the key challenges facing Software Engineering. **(08 Marks)**

c. Define (i) Feasibility Study (ii) Functional Requirements (iii) Non Functional Requirements (iv) Domain Requirements. **(04 Marks)**

OR

2 a. With a neat block diagram, explain the Spiral Process Model. **(08 Marks)**

b. Explain Requirement Elicitation and Analysis Process. **(08 Marks)**

c. What are the fundamental activities of Software Engineering? **(04 Marks)**

Module-2

3 a. Explain following important terms with example:
(i) Identity (ii) Classification (iii) Inheritance (iv) Polymorphism. **(10 Marks)**

b. Define the purpose of the following terms with suitable example and UML notation with respect to class model
(i) Multiplicity (ii) Association class **(10 Marks)**

OR

4 a. Explain in brief Class Model, State Model and Interaction model. **(10 Marks)**

b. What is Object Oriented Development? Explain different stages of Object Oriented Development. **(10 Marks)**

Module-3

5 a. Explain open source development in detail. **(10 Marks)**

b. Explain Model driven engineering in detail and mention Pros and Cons of it. **(10 Marks)**

OR

6 a. With a neat diagram explain context model, with an example. **(08 Marks)**

b. Explain the phases of Rational Unified Process Model. **(08 Marks)**

c. What is executable UML? Enlist features of executable UML. **(04 Marks)**

Module-4

7 a. With appropriate block diagram, explain the system evolution process. **(08 Marks)**

b. Describe the three types of Software maintenance. Why is it sometimes difficult to distinguish between them? **(08 Marks)**

c. Mention the advantages of Test Driven Development. **(04 Marks)**

OR

8 a. Explain the different levels in Development Testing. **(08 Marks)**

b. Explain the activities involved in Reengineering process with illustrative figures. **(08 Marks)**

c. Explain the four strategic options of Legacy System Management. **(04 Marks)**

Module-5

9 a. List and explain factors affecting software pricing. **(08 Marks)**

b. Mention the two approaches used for estimation techniques and explain algorithmic cost modeling. **(08 Marks)**

c. Bring out the differences between Testing and Inspection. **(04 Marks)**

OR

10 a. Explain plan driven development with a neat block diagram. **(10 Marks)**

b. Explain three Phases in which Review Process is carried out. **(06 Marks)**

c. Mention the differences between Product Standards and Process Standard. **(04 Marks)**

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18CS36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks: 100

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Prove that, for any propositions p, q, r the compound proposition $[(p \to q) \wedge (q \to r) \to (p \to r)]$ is a tautology. **(06 Marks)**

b. Test the validity of the following argument.

If I study, I will not fail in the examination.
If I do not watch TV in the evenings, I will study.
I failed in the examination.

$\therefore$ I must have watched TV in the evenings **(07 Marks)**

c. Let $p(x) : x^2 - 7x + 10 = 0$, $q(x) : x^2 - 2x + 3 = 0$, $r(x) : x < 0$. Find the truth or falsity of the following statements, when the universe U contains only the integers 2 and 5.

(i) $\forall x, p(x) \to \sim r(x)$ (ii) $\forall x, q(x) \to r(x)$

(iii) $\exists x, q(x) \to r(x)$ (iv) $\exists x, p(x) \to r(x)$ **(07 Marks)**

OR

2 a. Prove that, for any three propositions p, q, r $[(p \vee q) \to r] \Leftrightarrow [(p \to r) \wedge (q \to r)]$ **(06 Marks)**

b. Prove that, the following are valid arguments:

(i) $p \to (q \to r)$, $\sim q \to \sim p$, p / $\therefore r$

(ii) $\sim p \leftrightarrow q$, $q \to r$, $\sim r$ / $\therefore p$ **(07 Marks)**

c. Give :

(i) a direct proof
(ii) an indirect proof.
(iii) proof by contradiction for the following statement.

"If n is an odd integer, then n+9 is an even integer". **(07 Marks)**

Module-2

3 a. Prove that for each $1^2 + 2^2 + 3^2 + ... + n^2 = \frac{1}{6} n(n+1)(2n+1)$. **(06 Marks)**

b. Determine the coefficient of,

(i) xyz^2 in the expansion of $(2x - y - z)^4$.

(ii) $x^2y^2z^3$ in the expansion of $(3x - 2y - 4z)^7$. **(07 Marks)**

c. A woman has 11 close relatives and she wishes to invite 5 of them to dinner. In how many ways can she invite them in the following situations:

(i) There is no restriction on the choice.
(ii) Two particular persons will not attend separately.
(iii) Two particular persons will not attend together. **(07 Marks)**

OR

4 a. Prove that every positive integer $n \geq 24$ can be written as a sum of 5's and / or 7's. **(06 Marks)**

b. Find the number of permutations of the letters of the word MASSASAUGA. In how many of these all four A's are together? How many of them begin with S? **(07 Marks)**

c. In how many ways can one distribute eight identical balls into four distinct containers, so that, (i) No containers is left empty.
(ii) The fourth container gets an odd number of balls. **(07 Marks)**

Module-3

5 a. For any non empty sets A, B, C prove that,
(i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$
(ii) $(A \times (B - C)) = (A \times B) - (A \times C)$ **(06 Marks)**

b. Let $f : R \to R$ be defined by $f(x) = \begin{cases} 3x-5 & \text{for } x > 0 \\ -3x+1 & \text{for } x \leq 0 \end{cases}$.

(i) Determine f(0), $f\left(\frac{5}{3}\right)$ (ii) Find $f^{-1}([-5,5])$. **(07 Marks)**

c. Let f, g, h be functions form z to z defined by $f(x) = x - 1$, $g(x) = 3x$, $h(x) = \begin{cases} 0 & \text{if } x \text{ is even} \\ 1 & \text{if } x \text{ is odd} \end{cases}$. Verify that $(f \circ g) \circ h(x) = f \circ (g \circ h)(x)$. **(07 Marks)**

OR

6 a. Let $A = \{1,2,3,4,6\}$ and R be a relation on A defined by aRb if and only if "a is a multiple of b". Represent the relation R as a matrix and draw its diagraph. **(06 Marks)**

b. Draw the Hasse diagram representing the positive divisors of 36. **(07 Marks)**

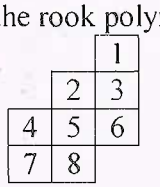
c. Let $A = \{1,2,3,4,5\}$, define a relation R on $A \times A$, by $(x_1, y_1) R (x_2, y_2)$ if and only if $x_1 + y_1 = x_2 + y_2$
(i) Verify that R is an equivalence relation.
(ii) Find the partition of $A \times A$ induced by R. **(07 Marks)**

Module-4

7 a. There are eight letters to eight different people to be placed in eight different addressed envelopes. Find the number of ways of doing this so that at least one letter gets to the right person. **(06 Marks)**

b. In how many ways can the 26 letters of the English alphabet be permuted so that none of the patterns CAR, DOG, PUN or BYTE occurs? **(07 Marks)**

c. By using the expansion formula, obtain the rook polynomial for the board C. **(07 Marks)**



OR

8 a. An apple, a banana, a mango and an orange are to be distributed to four boys B_1, B_2, B_3, B_4. The boys B_1 and B_2 do not wish to have apple. The boy B_3 does not want banana or mango, and B_4 refuses orange. In how many ways the distribution can be made so that no boy is displeased? **(06 Marks)**

b. If $a_0 = 0$, $a_1 = 1$, $a_2 = 4$ and $a_4 = 37$ satisfy the recurrence relation $a_{n+2} + ba_{n+1} + ca_n = 0$, for $n \geq 0$, find the constants b and c, and solve the relation a_n. **(07 Marks)**

c. How many integers between 1 and 300 (inclusive) are,
(i) Divisible by at least one of 5, 6, 8?
(ii) Divisible by none of 5, 6, 8? **(07 Marks)**

Module-5

9 a. Show that the following two graphs shown in Fig. Q9 (a) – (i) and Fig. Q9 (a) – (ii) are isomorphic, **(06 Marks)**

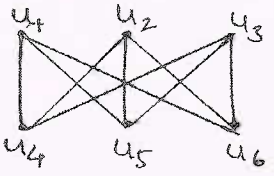


Fig. Q9 (a) – (i)

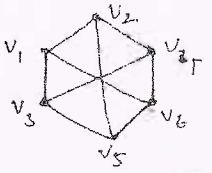


Fig. Q9 (a) – (ii)

b. Define the following with example of each,
(i) Simple graph (ii) Sub graph
(iii) Compliment of a graph (iv) Spanning sub graph **(07 Marks)**

c. Construct an optimal profix code for the symbols a, o, q, u, y, z that occurs with frequencies 20, 28, 4, 17, 12, 7 respectively. **(07 Marks)**

OR

10 a. Prove that two simple graphs G_1 and G_2 are isomorphic if and only if their complements are isomorphic. **(06 Marks)**

b. Let G = (V, E) be a simple graph of order $|V| = n$ and size $|E| = m$, if G is a bipartite graph. Prove that $4m \leq n^2$. **(07 Marks)**

c. Construct an optimal prefix code for the letters of the word ENGINEERING. Hence deduce the code for this word. **(07 Marks)**

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15CS44

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Microprocessor and Micro Controller

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With neat internal block diagram of 8088/86 CPU, explain the working of EU and BIU. **(08 Marks)**

b. What is stack and why is it needed? **(04 Marks)**

c. Assuming that SP = 1236H, AX = 24B6H, DI = 85C2H and DX = 5F93H, with supporting diagram show the contents of the stack as each of the following instruction is executed:
PUSH AX
PUSH DI
PUSH DX **(04 Marks)**

OR

2 a. Assume that the register have the following values and that CS = 1000H, DS = 2000H, SS = 3000H, SI = 4000H, DI = 5000H, BX = 6080H, BP = 7000H, AX = 25FFH, CX = 8791H and DX = 1299H. Calculate the physical address of the memory where the operand is stored and the contents of the memory location in each of the following addressing examples:
i) MOV [SI], AL
ii) MOV [SI + BX + 8], AH
iii) MOV [DI] [BX] + 28, CX
iv) MOV [BP] [SI] + 10, DX
v) MOV [BP] + 200, AX
vi) MOVIDI + BP + 100], AX **(06 Marks)**

b. With neat diagram discus the steps to create a program. **(06 Marks)**

c. Differentiate between EXE and .COM Fite format. **(04 Marks)**

Module-2

3 a. Explain the working of following instruction along with charge in flag bits:
i) ADC ii) SBB iii) DIV iv) DAA v) CMP **(10 Marks)**

b. Write a program that calculates the total sum paid to a salesperson for eight months. The following are monthly paychecks for those months (in Rs): 2300, 4300, 1200, 3700, 1298, 4323, 5673, 986. **(06 Marks)**

OR

4 a. Write a program that:
i) Cleans the screen
ii) Set the curser at row = 8 and column = 14
iii) Displays the string "What is your Name?" **(06 Marks)**

b. With neat diagram illustrate the interrupt vector table. **(06 Marks)**

c. Write short note on the following: i) Type 0 and ii) Type 2 interrupts. **(04 Marks)**

Module-3

5 a. Write a program to find the average of following signed numbers:
+13, -10, +19, +14, -18, -9, +12, -19, +16 **(08 Marks)**

b. Assume that we have 4 bytes of data: 25H, 62H, 3FH and 52H.
i) Find the checksum byte
ii) Perform the checksum operation to ensure data integrity
iii) If the second byte 62H been changed to 22H, show how checksum detects the error. **(08 Marks)**

OR

6 a. Outline the control word format of 8255 PPI with neat diagram. **(06 Marks)**

b. Demonstrate the following with example: i) IN ii) OUT. **(04 Marks)**

c. Find the control word if Port A = out, Port B = in, Port C (lower) = in and Port C (upper) = out. Program the 8255 to get data from Port A and send it to Port B. In addition data from Port C (lower) is sent out to the Port C (upper). Use port addresses of 300H-303H for the 8255 chip. **(06 Marks)**

Module-4

7 a. Distinguish between micro processor and microcontroller. **(05 Marks)**

b. With supporting diagram demonstrate the RISC design philosophy. **(05 Marks)**

c. Explain the memory remapping of embedded system software for initialization (Boot) code. **(06 Marks)**

OR

8 a. Explain with neat diagram, ARM core dataflow model. **(08 Marks)**

b. With neat diagram illustrate the seven processor modes. **(08 Marks)**

Module-5

9 a. Demonstrate the working of barrel shifter with help of example. **(06 Marks)**

b. Illustrate the following instruction with an example:
i) RSB ii) SUB iii) EOR iv) CMN v) TST. **(10 Marks)**

OR

10 a. Write ARM assembly language program for data transfer, arithmetic and logical operation. **(08 Marks)**

b. Demonstrate the following load-store instructions:
i) LDR r0, [r1, #4]!
ii) LDR r0, [r1, #4]
iii) LDR r0, [r1], #4 **(08 Marks)**

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15CS46

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Data Communication

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. What in data communication? Explain data flow techniques of data communication. **(05 Marks)**

b. Explain the functionalities of OSI reference model layers. **(07 Marks)**

c. What is physical and logical addresses in TCP/IP reference model. **(04 Marks)**

OR

2 a. Explain period, frequency and phase of an periodic analog signal. For the given signal (sine wave) with offset 1/6 cycle with respect to time(0), find the phase of the signal, express phase in terms of degree and radiance. **(05 Marks)**

b. What are the causes for transmission impairments during signal transmission through channel? **(05 Marks)**

c. Draw line code for the sequence 010011001 using NRZ, Bipolar, Manchester and differential Manchester. **(06 Marks)**

Module-2

3 a. Explain process–sampling with respect to PCM (Pwse code modulation)? Explain different types of sampling methods. **(05 Marks)**

b. What is parallel and serial data transmission? Explain the three ways, how the serial transmission is achieved. **(05 Marks)**

c. An analog signal with bit rate. 6000 bps and baud rate 1000 baud, find how many data elements are carried by each signal element? Also find how many signal elements are required. **(06 Marks)**

OR

4 a. Explain the mechanisms for modulating digital data into analog signal (Data). **(08 Marks)**

b. Define multiplexing and de-multiplexing. With the diagram explain the Frequency Division. Multiplexing (FDM) technique. **(08 Marks)**

Module-3

5 a. Find the code word for the following using CRC. Given information polynomial $i(x) = x^6 + x^3$ and generator polynomial $g(x) = x^3 + x + 1$. **(06 Marks)**

b. Explain the working of any two protocols of noisy channels. **(10 Marks)**

OR

6 a. Explain frame types of HDLC. **(05 Marks)**

b. Explain PPP protocol frame format, with the diagram. Also mention the different transition phases of PPP. **(08 Marks)**

c. What is framing in data lank layer, explain different techniques to identify frame boundaries. **(03 Marks)**

Module-4

7 a. What are ALOHA protocols? Explain its different types with respect to channel multiple accesses. **(06 Marks)**

b. Explain channelization protocols for multiple access with diagram. **(10 Marks)**

OR

8 a. What is persistence methods? Explain the behavior of pernistance methods with diagram. **(06 Marks)**

b. What is hidden and exposed station problem? Explain with the diagram. **(05 Marks)**

c. What is Piconets and Scatternets? Explain the working with the diagram. **(05 Marks)**

Module-5

9 a. Write a note on IPV6 header format. **(10 Marks)**

b. Explain mobile IP with phases. **(06 Marks)**

OR

10 a. What is routing of packets? With respect to data communication. Explain intra domain and inter domain routing techniques. **(10 Marks)**

b. Write a note on multicast routing protocols. **(06 Marks)**

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17CS42

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Object Oriented Concepts

Time: 3 hrs. Max. Marks: 100

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain how C++ allows member functions in structures. Give example. **(06 Marks)**

b. What is data abstraction? How is it implemented in C++? **(06 Marks)**

c. What is function overloading? Write a C++ program to define three overloaded functions area ( ) to find area of circle, triangle and rectangle. **(08 Marks)**

OR

2 a. How we can make some specific member functions of one class friendly to another class? **(06 Marks)**

b. What is constructor? List the different types of constructors and explain default constructor with example. **(08 Marks)**

c. What is static member of a class? Write a C++ program to count the number of objects created. **(06 Marks)**

Module-2

3 a. List and explain the java buzzwords. **(08 Marks)**

b. Explain the concepts of arrays in java with examples. **(07 Marks)**

c. Explain type conversion in java with an example. **(05 Marks)**

OR

4 a. Write a java program to initialize and display different types of integer and floating point variables. **(05 Marks)**

b. List and explain different jump statements used in java with examples. **(07 Marks)**

c. List and explain different iteration statements used in java with examples. **(08 Marks)**

Module-3

5 a. Write a program in java to implement a stack operations that can hold 10 integers. **(07 Marks)**

b. Compare and contrast method overloading and method overriding with examples. **(08 Marks)**

c. Describe the significance of super in java. Give example. **(05 Marks)**

OR

6 a. Define package. What are the steps involved in creating user defined package with an example. **(08 Marks)**

b. What is an exception? How java supports exception handling mechanism. Give example. **(07 Marks)**

c. Explain how variables in interfaces are used. Give example. **(05 Marks)**

Module-4

7 a. What is thread? Explain two ways of creation of threads. **(07 Marks)**

b. Describe thread priority. How to assign and get the thread priority. **(07 Marks)**

c. Explain the following with syntax and example,
(i) wait ( ) (ii) notify ( ) (iii) notifyAll ( ). **(06 Marks)**

OR

8 a. What is meant by deadlock? How to avoid deadlock? Give example. **(10 Marks)**

b. Briefly explain the role of inner class and anonymous inner class in java. **(05 Marks)**

c. What is an event class? List and explain different event classes available in java. **(05 Marks)**

Module-5

9 a. Explain the five methods of Applet. **(05 Marks)**

b. Explain the HTML Applet tag with syntax and example. **(07 Marks)**

c. Write a swing program for displaying any one of the options : C, C++, Java, PHP through the selection of combo box by clicking the show button. **(08 Marks)**

OR

10 a. Explain with syntax:
(i) JLabel (ii) JTextField (iii) JButton (iv) JCheckBox (v) JComboBox. **(10 Marks)**

b. Write a program to create a table with column headings such as Fname, Lname, Address, Age and insert at least 5 records in the table and display. **(10 Marks)**

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17CS43

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain Asymptotic notations in detail with example. **(12 Marks)**

b. Outline an algorithm to find maximum of n elements and obtain its time complexity. **(08 Marks)**

OR

2 a. Design algorithm for tower of Hanoi problem and obtain time complexity. **(10 Marks)**

b. Prove the theorem
if $f_1(n) \in 0$ (g, (n)) and $f_2(n) \in 0$ (g_2 (n)) Then $f_1(n) + f_2(n) \in 0$ (max $\{g_1(n), g_2(n)\}$). **(10 Marks)**

Module-2

3 a. Design a recursive algorithm for binary search and calculate time complexity. **(10 Marks)**

b. Write the algorithm for merge sort and Trace 60, 50, 25, 10, 35, 25, 75, 30. **(10 Marks)**

OR

4 a. Develop an algorithm for Quick sort and derive its time complexity. **(10 Marks)**

b. What is topological sorting? Apply DFS for below graph to solve topological sorting. **(10 Marks)**

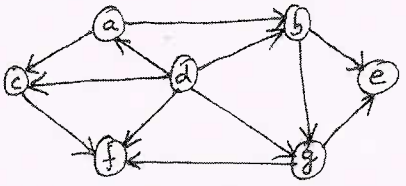


Fig.Q.4(b)

Module-3

5 a. Find the optimal solution to the knap sack instant n = 7, m = 15 using greedy method.

Object	1	2	3	4	5	6	7
Weight	02	03	05	07	01	04	01
Profit	10	05	15	07	06	18	03

(10 Marks)

b. Find the minimum spanning tree using Kruskal's algorithm.

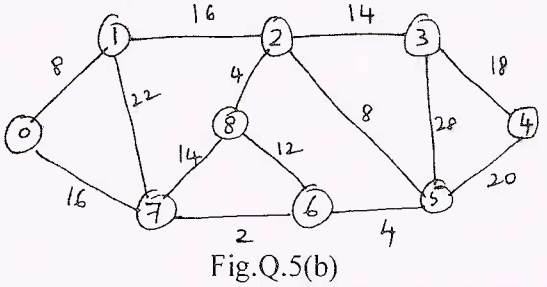


Fig.Q.5(b)

(10 Marks)

OR

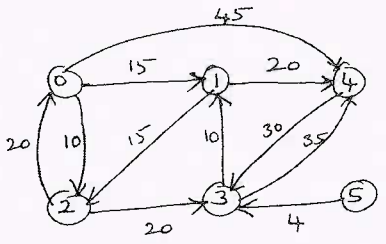
6 a. Construct a Huffman code for the following data:

Characters	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15

Encode the text ABACABAD and decode 100010111001010 **(10 Marks)**

b. Calculate the shortest distance and shortest path from vertex 5 to vertex 0 using Dijkstra's. **(10 Marks)**

Fig.Q.6(b)



Module-4

7 a. Explain the general procedure to solve a multistage graph problem using backward approach with an example. **(10 Marks)**

b. Construct an optimal binary search tree for the following:

Items :	A	B	C	D
Probabilities :	0.1	0.2	0.4	0.3

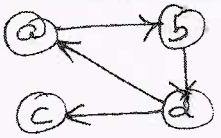
(10 Marks)

OR

8 a. Design Floyd's algorithm to find shortest distances from all nodes to all other nodes. **(10 Marks)**

b. Apply Warshall's algorithm to compute transitive closure for the graph below. **(10 Marks)**

Fig.Q.8(b)



Module-5

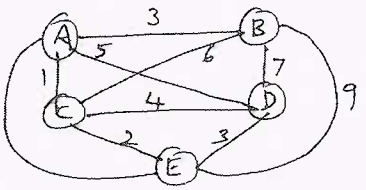
9 a. What is Hamiltonian circuit problem? What is the procedure to find Hamiltonian circuit of a graph? **(10 Marks)**

b. Explain the classes of NP-Hard and NP-complete. **(10 Marks)**

OR

10 a. Apply the branch and bound algorithm to solve the travelling salesman problem for the graph below.

Fig.Q.10(a)



(10 Marks)

b. Obtain the optimal solution assignment problem given:

	J_1	J_2	J_3	J_4
a	9	2	7	8
b	6	4	3	7
c	5	8	1	8
d	7	6	9	4

(10 Marks)

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17CS44

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Microprocessor and Microcontrollers

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume missing data suitably.

Module-1

1 a. Explain Execution Unit (EU) and Bus Interface Unit (BIU) of 8086 with a neat diagram. **(08 Marks)**

b. With an example distinguish between physical address, logical address and offset address. If CS = 2000h, DS = 3000h, SS = 4000h, ES = 5000h, BX = 0030h, BP = 0020h, find the physical address for i) MOV AL, [BP] ii) MOV CX, [BX] iii) Add AX, 20[BX]. **(06 Marks)**

c. Explain the following addressing modes of 8086:
i) Register Indirect
ii) Based Index
iii) Relative Based Index
iv) Direct Memory. **(06 Marks)**

OR

2 a. Explain all bits of flag register of 8086 μ_p with a neat diagram. Show the setting and resetting of flag bits with a suitable example. **(06 Marks)**

b. What are Assembler directives? Explain the following assembler directives with an example: i) PUBLIC ii) ORG iii) ASSUME iv) PTR. **(08 Marks)**

c. Develop an 8086 Assembly Language Program (ALP) to sort a given set of 'n' 16-bit numbers in descending order. Using Bubble sort algorithm to sort given elements. **(06 Marks)**

Module-2

3 a. Explain the following instructions with an example: i) DAA ii) AAM iii) SHR iv) TEST v) LEA vi) PUSH vii) LDS viii) CBW. **(08 Marks)**

b. What is an interrupt? Explain various types with an interrupt vector table. **(06 Marks)**

c. Assume that there is a class of five people with following grades: 69, 87, 96, 45, 75. Develop an ALP to find the highest grade. **(06 Marks)**

OR

4 a. Develop an ALP that adds the following two multiword numbers and saves the result:
Data 1 = 548FB9963CE7H
Data 2 = 3FCD4FA23B8DH. **(08 Marks)**

b. Develop an ALP to perform the following:
i) Clear the screen.
ii) Set the cursor at row 8 and column 5 of the screen.
iii) Prompt "There is a message for you from VTU, to read it enter Y. If the user enter 'Y' or 'y' then the message "Hello! All the best for you exams" will appear on the screen. If the user enters any other key, then the prompt. "No more messages for you" should appear on the next line. **(08 Marks)**

c. Develop an ALP to count the number of ones and zeros in a given 8 bit data using rotate instructions. **(04 Marks)**

Module-3

5 a. Explain handling of overflow problem that arises in addition of signed numbers with a suitable example. **(06 Marks)**

b. Develop an ALP using string instructions to accept a string from keyboard and check for palindrome and display appropriate messages on the screen. **(06 Marks)**

c. Design a memory system for 8086 with one 64KB RAM and one 64KB Rom at address 30000H to F0000H show the complete design along with memory mapping and draw the final diagram with address decoder. **(08 Marks)**

OR

6 a. Briefly explain the control word format of 8255 in I/O mode and BSR mode. Find the control word if PA = out, PB = in, $PC_0 - PC_3$ = in and $PC_4 - PC_7$ = out. Use post addresses of 300H-303H for the 8255 chip. Then get data from port B and send it to port A. **(08 Marks)**

b. Assume that we have 4 byte of hexadecimal data: 25H, 62H, 3FH and 52H

i) Find the checksum byte

ii) Perform the checksum operation to ensure data integrity.

iii) If the second byte 62H had been changed to 22H. Show how checksum detects the error. **(08 Marks)**

c. Explain XLAT instruction with example. **(04 Marks)**

Module-4

7 a. Differentiate between RISC and CISC processors. **(06 Marks)**

b. Explain ARM core data flow model with a neat diagram. **(06 Marks)**

c. With diagram explain the various blocks in a 3 stage pipeline of ARM processor organization. **(08 Marks)**

OR

8 a. Explain the various fields in the current program status register. **(08 Marks)**

b. Explain the architecture of a typical embedded device based in ARM core with a neat diagram. **(08 Marks)**

c. Describe the various modes of operation of ARM processor. **(04 Marks)**

Module-5

9 a. Write/develop an ALP to copy a block of data (Block 1) to another block (block 2) using ARM instructions. **(08 Marks)**

b. Explain the following instructions of ARM processor with suitable examples:
i) MLA ii) QADD iii) SMULL iv) LSL. **(08 Marks)**

c. If $r_5 = 5$, $r_7 = 8$ using the following instructions, write values of r_5, r_7 after execution of MOV r_7, r_5, LSL #2. **(04 Marks)**

OR

10 a. Write short notes on:

i) Memory access

ii) Branch instruction of ARM controller. **(08 Marks)**

b. Explain various types of SWAP instructions with syntax and example. **(06 Marks)**

c. Develop an ALP to find factorial of given number using LOOKUP table and ARM instruction set. **(06 Marks)**

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17CS45

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Software Engineering

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is software engineering? Briefly discuss the need for software engineering. **(08 Marks)**

b. With a neat diagram, explain the activity model of the insulin pump control system. **(08 Marks)**

c. List and explain any four software engineering code of ethics. **(04 Marks)**

OR

2 a. With a neat diagram, explain the water-fall model of software development process. List the drawbacks of waterfall model. **(08 Marks)**

b. Briefly discuss the important activities of requirements engineering process with a neat diagram. **(06 Marks)**

c. What is requirements validation? List and explain any four different checks to be carried out during requirements validation process? **(06 Marks)**

Module-2

3 a. Draw and explain state diagram of a microwave oven. **(08 Marks)**

b. Explain the terms class diagram, generalization and aggregation. **(08 Marks)**

c. Draw the sequence diagram for Patient Information System. **(04 Marks)**

OR

4 a. With a neat diagram, explain the Rational Unified Process. **(08 Marks)**

b. What is design pattern? Explain four elements of design pattern. **(06 Marks)**

c. What is software reuse? State the general models of open source licenses. **(06 Marks)**

Module-3

5 a. What is component testing? List and explain the different types of interface errors. **(06 Marks)**

b. Explain performance testing in detail. **(08 Marks)**

c. Explain the six stages of acceptance testing process. **(06 Marks)**

OR

6 a. With a neat diagram briefly discuss the software reengineering process. **(08 Marks)**

b. What is software maintenance? Explain the three different types of software maintenance. **(04 Marks)**

c. Explain software evolution process. **(08 Marks)**

Module-4

7 a. List and explain factors affecting software pricing. **(06 Marks)**

b. Explain briefly COCOMOIT model. **(08 Marks)**

c. Explain briefly the software review process. **(06 Marks)**

OR

8 a. Explain the various inspection checks for software inspection process. **(10 Marks)**

b. Discuss in detail the different stages in component measurement process with diagram. **(10 Marks)**

Module-5

9 a. Explain the practices involved in extreme programming. **(10 Marks)**

b. With a neat diagram explain the process of prototype development. What are the benefits of a prototype? **(10 Marks)**

OR

10 Write short notes on the following :

a. Agile methods

b. Testing in XP

c. Pair programming

d. Incremental delivery. **(20 Marks)**

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17CS46

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Data Communications

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Describe data communication and its components. **(05 Marks)**

b. Analyze the principle behind protocol layering. Enumerate the functions of different layers of OSI model. **(10 Marks)**

c. Differentiate Defacto standard and Dejure standard. **(05 Marks)**

OR

2 a. Analyze the causes of transmission impairments. **(05 Marks)**

b. Define line coding. Enumerates the challenges in line coding. Draw the line code of the sequence 010011110 using polar NRZ – L and NRZ – I schemes. **(10 Marks)**

c. In a digital transmission, the receiver clock is 0.3 percent faster than the sender clock. How many extra bits per second does the receiver receive if the data rate is 1Mbps. **(05 Marks)**

Module-2

3 a. Explain the three step procedure of pulse code modulation for analog to digital conversion with example. **(10 Marks)**

b. Briefly explain with neat diagrams. Amplitude shift keying and frequency shift keying modulation techniques. Specify bandwidth requirements. **(05 Marks)**

c. An analog signal has a bit rate of 8000 bps, and a baud rate of 1000 baud. How many data element are carried by each signal elements? How many signal elements do we need? **(05 Marks)**

OR

4 a. Describe about Frequency Division Multiplexing in brief with neat diagram. **(05 Marks)**

b. What is circuit switching? Enumerate the characteristics of circuit, switching. Analyze the three stages of circuit switching. **(10 Marks)**

c. Analyze how message can be transmitted from one system to another using datagram network and calculate the total delay in the network. **(05 Marks)**

Module-3

5 a. Describe three types of errors. **(05 Marks)**

b. Explain the encoder and decoder logic of Cyclic Redundancy Check (CRC) coding with neat diagram. **(10 Marks)**

c. Given message = 1011011, k = 7 and generator polynomial $P(X) = X^3 + X^2 + X^0$, n = 3. Find the codeword and design the checker in the receiver using Cyclic Redundancy Codes (CRC). **(05 Marks)**

OR

6 a. Explain the working of stop-and-wait protocol for Noiseless channels. **(05 Marks)**

b. Explain selective repeat ARQ protocol for noisy channels. **(05 Marks)**

c. Explain the frame format of HDLC protocol. **(05 Marks)**

d. Describe the transition phases of PPP protocol with Finite State Machines. **(05 Marks)**

Module-4

7 a. Analyze the need for access control protocols. Explain the working of CSMA/CD with suitable diagrams. **(10 Marks)**

b. Describe pure ALOHA and slotted ALOHA protocols. **(05 Marks)**

c. Discuss 802.3 MAC frame format. **(05 Marks)**

OR

8 a. Analyze Gigabit Ethernet. **(05 Marks)**

b. Brief on Bluetooth and explain the architecture of Bluetooth. **(05 Marks)**

c. Analyze channelization. Explain Code Division Multiple Access (CDMA) with an example. **(10 Marks)**

Module-5

9 a. Explain the operation of cellular telephony. **(05 Marks)**

b. Explain the working of mobile IP. **(05 Marks)**

c. Analyze satellite networks and its different categories. **(10 Marks)**

OR

10 a. Explain IP datagram header format with neat diagram and given the description of each field. **(10 Marks)**

b. Explain the transition from IPV4 to IPV6. **(05 Marks)**

c. Write a short note on fixed WiMax. **(05 Marks)**

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17CS/IS32

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Analog & Digital Electronics

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. With circuit symbol and characteristic curves, explain the working of N-Channel E-MOSFET. **(08 Marks)**

b. List out the differences between JFETs and MOSFETs. **(06 Marks)**

c. Briefly discuss the working principles of CMOS. **(06 Marks)**

OR

2 a. Explain with a neat diagram current to voltage and voltage to current converter (using opamp) **(06 Marks)**

b. Explain the performance parameter of opamp. **(08 Marks)**

c. With necessary circuit diagram and waveforms, explain the operation of a relaxation oscillator using opamp. **(06 Marks)**

Module-2

3 a. Give simplified logic equation of $y = \sum m(0,1,2,3,10,11,12,13,14,15)$ using Quinc-Mc clusky method. **(10 Marks)**

b. Find the minimal sum and minimal product using K-map.
$f(a,b,c,d) = \sum m(6,7,9,10,13) + d(1,4,5,11)$ **(08 Marks)**

c. Implement the following using NAND gates only. **(02 Marks)**

OR

4 a. Draw the timing diagram and write a verilog HDL code (using structural model) for the Boolean function Y = NAND (y_1, y_2) where $y_1 = A + B$ and $y_2 = B + C$. **(08 Marks)**

b. Write the truth table of the logic circuit having three inputs A, B and C and the output expression as $y = \overline{A}BC + ABC$. Also simplify the expression using Boolean algebra and implement the logic circuit using NAND gates. **(06 Marks)**

c. Realize basic gates using only NAND gates and only NOR gates. **(06 Marks)**

Module-3

5 a. Implement the following Boolean function using 4 : 1 MUX.
$F(A, B, C, D) = \sum m(0,1,2,4,6,9,12,14)$ **(06 Marks)**

b. Construct 16 : 1 MUX using 4 to 1 and 2 to 1 MUX. **(06 Marks)**

c. What is magnitude comparator? Design and explain 2-bit magnitude comparator. **(08 Marks)**

OR

6 a. Explain the positive edge-triggered JK flip flop with necessary logic diagram, truth table and waveforms. **(08 Marks)**

b. Illustrate the three basic circuits used in arithmetic building blocks. **(06 Marks)**

c. Design a 4 to 1 MUX, using conditional assign and case statements. **(06 Marks)**

Module-4

7 a. Briefly discuss the various representations of flip flops. **(12 Marks)**

b. Explain parallel-in-serial out shift register with example. **(08 Marks)**

OR

8 a. With block diagram, truth table and output waveforms, explain the 3-bit binary ripple down counter. **(10 Marks)**

b. Design synchronous mod-5 up counter using JK flip flops. **(10 Marks)**

Module-5

9 a. Design and construct divide by 60 counter. **(10 Marks)**

b. Design a self-correcting modulo-6 counter in which all unused state leads to state CBA = 000. **(10 Marks)**

OR

10 a. With n7ecessary circuit diagram and waveform, explain continuous analog-to-digital converter. **(10 Marks)**

b. Explain 4-bit digital to analog converter. **(10 Marks)**

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15CS42

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Software Engineering

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. What are the attributes of good software? **(04 Marks)**
b. Construct and explain the water fall model of software development process. **(05 Marks)**
c. Write a note on requirement elicitation and analysis. **(07 Marks)**

OR

2 a. What are the professional and ethical responsibility of software engineering. **(04 Marks)**
b. Explain insulin pump system by constructing its activity model. **(06 Marks)**
c. Briefly describe the different types of non-functional requirements. **(06 Marks)**

Module-2

3 a. List out the different types of UML diagrams. And explain process model of involuntary detention in MHC-PMS by constructing activity diagram. **(08 Marks)**
b. Determine the state diagram for the weather station system. Explain how it responds to request for various services. **(08 Marks)**

OR

4 a. What are the different implementation issues in software Engineering? **(08 Marks)**
b. Construct the class diagram for MHC-PMS which represents classes and association between the classes. Also explain the generalization and aggregation techniques. **(08 Marks)**

Module-3

5 a. What are the different types of interfaces between program components and interface errors? **(08 Marks)**
b. Analyze the benefits of reengineering over replacement. With a block diagram describe the activities in the reengineering process. **(08 Marks)**

OR

6 a. List the advantages of software inspection over testing and show that how inspection and testing supports in validation and verification of the software process. **(08 Marks)**
b. Describe the factors used in environment assessment and application assessment. **(06 Marks)**
c. Construct the block diagram of the software evolution process. **(02 Marks)**

Module-4

7 a. What are the factors affecting software pricing. **(03 Marks)**
b. Construct and explain the UML activity diagram for the project planning. **(05 Marks)**
c. With necessary diagram, describe the phaser of software review process. **(08 Marks)**

OR

8 a. Illustrate how Agile planning is applied in "planning in XP" **(08 Marks)**
b. Write a note on inspection checklist. **(05 Marks)**
c. Listout the software quality attributes. **(03 Marks)**

Module-5

9 a. Explain Boehm's spiral model. **(08 Marks)**
b. Summarize the practices involved in extreme programming. **(08 Marks)**

OR

10 a. Describe how SCRUM process helps in Agile project management. **(08 Marks)**
b. List and explain the phases of Rational Unified process (RUP) **(08 Marks)**

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15CS43

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Design and Analysis of Algorithm

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. What is an Algorithm? Explain any six properties to specify an algoirhtm. **(07 Marks)**

b. If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then prove that $t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$ **(05 Marks)**

c. Design an Algorithm to find a largest of a given number and analyze its efficiency. **(04 Marks)**

OR

2 a. Define Asymptotic rotation, explain Big-Oh notation and show that $10n^3 + 5 \in O(n^3)$. **(07 Marks)**

b. Consider a recurrence relation $T(n) = T(n-1) + n$, with initial condition $T(0) = 0$. Solve it using subsituational method. **(04 Marks)**

c. Compare the order of growth of $\log_2(n)$ and $\sqrt{n}$ using limits. **(05 Marks)**

Module-2

3 a. Design Binary search algorithm and derive its time complexity by applying Master Theorem. **(07 Marks)**

b. Apply quick sort to sort the list E, X, A, M, P, L, E and draw the recursive calls tree. **(06 Marks)**

c. Derive Strassen's matrix multiplication time complexity by applying substitutional method. **(03 Marks)**

4 a. Design Merge sort algorithm. Apply it to sort the list of elements 70, 20, 30, 40, 10, 50, 60. **(07 Marks)**

b. Write two advantages and disadvantages of Divide and conquer. **(04 Marks)**

c. Apply source removal algorithm to solve topological sorting problem for the following graph. (Ref. Fig Q No.4 (c)).

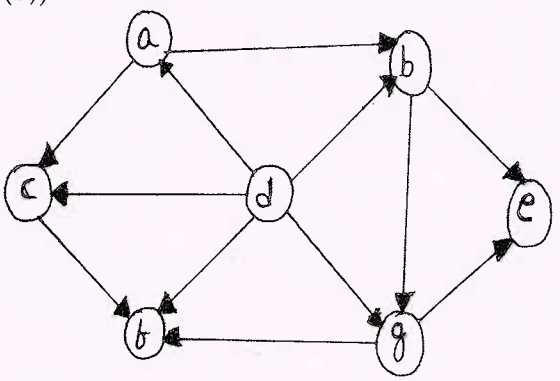

Fig Q4(c) **(05 Marks)**

Module-3

5 a. Define Greedy technique, feasible solution and optimal solution. Write general algorithm of greedy method. **(05 Marks)**

b. What is Knapsack problem? Find a feasible solution considering maximum profit, minimum weight and profit by weight ration to the Knapsack instance n = 7, m = 5, (P_1, P_2, P_3, P_4, P_5, P_6, P_7) = (10, 5, 15, 7, 6, 18, 3) and (w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1) **(05 Marks)**

c. i) Construct a Huffman tree for the following data and obtain in Huffman code.

Character	A	B	C	D	E	_
Probability	0.5	0.35	0.5	0.1	0.4	0.2

ii) Encode the text DAD_BE using the code of Question (i)

iii) Decode the text whose encoding is 1100110110 in the code of question (i) **(06 Marks)**

OR

6 a. Define a Heap and list the important properties of Heap. **(03 Marks)**

b. Compute a minimum cost spanning tree for the graph shown below in Fig Q6(b). Using i) Prim's and ii) Kruskal algorithm.

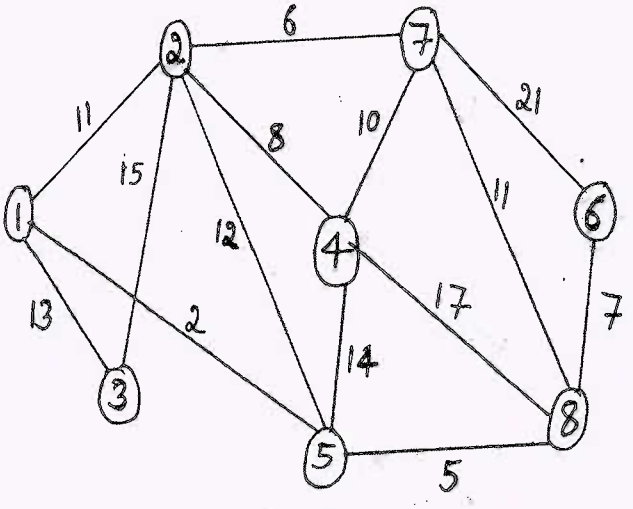

Fig Q6(b) **(08 Marks)**

c. Solve the following instances of the single source shortest paths problems with vertex a as the source. (Ref Fig Q No 6(c)).

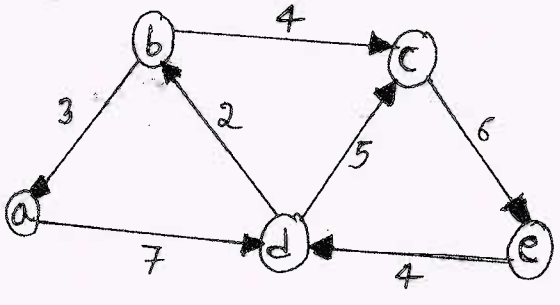

Fig Q6(c) **(05 Marks)**

Module-4

7 a. Design Warshall Algorithm. Apply Warshalls to find the transitive closure of the graph defined by the following adjacency matrix.

	a	b	c	d
a	0	1	0	0
b	0	0	0	1
c	0	0	0	0
d	1	0	1	0

(08 Marks)

b. Design Floyd's Algorithm, write one difference between FLOYD's and Dijkstra's algorithm. Apply Floyd's algorithm to the following graph. Ref Fig Q7(b)).

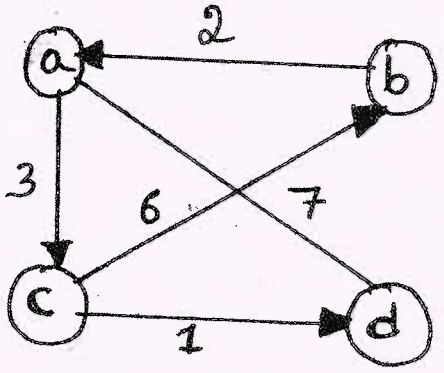

Fig Q7(b) **(08 Marks)**

OR

8 a. Write the recurrence relation to find the optimal solution for the Knapsack problem using Dynamic programming and find the optimal solution for the following instance.

Item	Weight	Value
1	2	$12
2	1	$10
3	3	$20
4	2	$15
Capacity w = 5		

(08 Marks)

b. Find shortest path from node 1 to every other node in the graph as given below in Fig Q8(b). Using Bellamn Ford Algorithm.

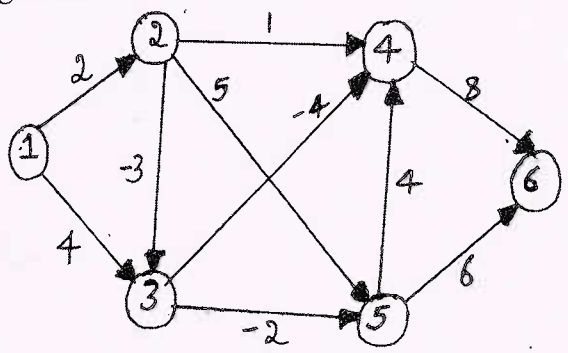

Fig Q8(b) **(08 Marks)**

Module-5

9 a. Design and implement in Java to find a subset of a given set S = {S_1, S_2, S_3.....S_n} of n positive integers whose sum is equal to a given positive integer d. **(08 Marks)**

b. Explain Backtracking concept and generate atleast 4 solutions for 5 Queen's problem. **(08 Marks)**

OR

10 Explain the following :

a. NP problems

b. NP – Complete problems

c. Graph coloring

d. Hamilton cycles. **(16 Marks)**

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15CS44

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Microprocessors and Microcontrollers

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With a neat diagram, explain architecture of 8086-Microprocessor. **(08 Marks)**

b. Explain the following addressing modes
   i) Immediate addressing mode
   ii) Register addressing mode
   iii) Direct memory addressing mode
   iv) Base relative addressing mode. **(08 Marks)**

OR

2 a. What is assembler directives? Explain any three assembler directives. **(08 Marks)**

b. If DS = 5000H and the offset is 1950H. Calculate:
   i) Physical address
   ii) Logical address
   iii) Lower range of the data segment
   iv) Upper range of the data segment. **(04 Marks)**

c. Write assembly language program to add 4 bytes of data stored in data segment. **(04 Marks)**

Module-2

3 a. Explain the following instructions with an example:
   i) INC ii) DAA iii) CMP iv) MUL. **(08 Marks)**

b. Write an ALP to sort a given set of 16 bit numbers in ascending order using Bubble sort. **(08 Marks)**

OR

4 a. Explain with example shift and rotate instructions. **(08 Marks)**

b. Write a code to perform the following:
   i) Clear the screen
   ii) To set the cursor
   iii) To display simple message 'welcome to microprocessor'. **(08 Marks)**

Module-3

5 a. Explain the syntax of the following instructions with example:
   i) STOSB ii) CMPSB iii) CBW iv) XLAT. **(08 Marks)**

b. Explain 74138 decoder configuration to enable the memory address F0000H to F3FFFH to 16 × 8 ROM **(08 Marks)**

OR

6 a. Write an assembly language program to move string of data from one memory location STR_1 to another memory location STR_2. **(06 Marks)**

b. For the given set of hexadecimal data find the checksum byte
34H, 54H, 7FH, 11H, E6H, 99H **(04 Marks)**

c. i) Find the control word port A as input, port B as output, port C as output. Use port addresses of 310H to 313H for the 8255 chip.
ii) Program the ports to input data from port A and send it to both port B and C. **(06 Marks)**

Module-4

7 a. Explain briefly the embedded system hardware components. **(06 Marks)**

b. Explain the registers of the ARM core processor. **(06 Marks)**

c. Differentiate between RISC and CISC processor. **(04 Marks)**

OR

8 a. Explain ARM core data flow model with a neat diagram. **(08 Marks)**

b. Explain the condition flags of ARM processor. **(04 Marks)**

c. Explain the concept of pipeline in ARM processor. **(04 Marks)**

Module-5

9 a. Explain the following instructions: i) LSL ii) RSB iii) ORR iv) MLA **(08 Marks)**

b. Write an assembly language program to using ARM instructions to copy a block of data to another block. **(08 Marks)**

OR

10 a. Explain software interrupt instruction of ARM processor. **(06 Marks)**

b. Explain Branch instruction of ARM controller. **(04 Marks)**

c. Explain various types of multiply instructions with example. **(06 Marks)**

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15CS45

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Object Oriented Concepts

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. List out the differences between object oriented programming and procedure oriented programming. **(06 Marks)**

b. Explain the following with example :
i) Console I/O
ii) Reference variable
iii) Function prototyping. **(04 Marks)**

c. Write a C++ program with class student with data members : name, usn, marks, perc and member functions : readDetails( ), printDetails( ), calcPercentage( ) and read 50 student details and print all details. **(06 Marks)**

OR

2 a. Compare C and C++ and list the differences. **(04 Marks)**

b. Write a C++ program to overload a function volume( ) to calculate volume of a box, cylinder and cube. **(06 Marks)**

c. Define a class A with data members : int a, float b and int *ptr. Define a constructor to initialize a, b and ptr to point to a dynamically allocated variable and define a destructor to deallocate the dynamically allocated variable and deinitialize a, b and ptr. **(06 Marks)**

Module-2

3 a. Explain the java buzzwords. **(06 Marks)**

b. Explain declaration and initialization of one dimensional and two dimensional arrays in java with examples. **(04 Marks)**

c. Write a java program with a class employee with data members : name, id, basic and net. And methods : read( ) calcnet( ) – to calculate net salary and print details( ). **(06 Marks)**

OR

4 a. Explain data abstraction and the pillars of OOP. **(06 Marks)**

b. Write a java program to print all prime number from 2 to 100. **(06 Marks)**

c. Write for each loop to calculate sum of 10 integers and print. **(04 Marks)**

Module-3

5 a. Explain the following with an example :
i) Use of "this" keyword in java
ii) finalize( ) method. **(04 Marks)**

b. With example explain two uses of "super" keyword. **(06 Marks)**

c. Explain how to define a package and import a package in to a program. **(06 Marks)**

OR

6 a. Define a class box with data members : width, height and length and define three overloaded constructions to :
   i) Pass values for all 3 members
   ii) Initialize all members to – 1
   iii) Assign same value to all three. **(06 Marks)**

b. Illustrate order of calling the constructors in a multilevel inheritance hierarchy. **(04 Marks)**

c. Explain the exception handling keywords in java with example. **(06 Marks)**

Module-4

7 a. With an example explain how to create a new thread using runnable interface. **(06 Marks)**

b. Explain hour one thread can wait for another thread to finish using is Alive( ) and join( ) methods. **(04 Marks)**

c. Explain the MouseListener and WindowListener interfaces with methods and their prototype. **(06 Marks)**

OR

8 a. With an example explain how to create a new thread using thread class. **(06 Marks)**

b. Write a program for producer – consumer problem using wait( ), notify( ) and notifyall( ) methods. **(06 Marks)**

c. Write a program to handle any three keyboard events. **(04 Marks)**

Module-5

9 a. Explain the methods and their use of the Applet class. **(04 Marks)**

b. Write an Applet program to display font name and font size by passing parameters to an Applet. **(06 Marks)**

c. Create a swing Applet with two buttons "OK" and "EXIT" and display a message which button is pressed. **(06 Marks)**

OR

10 a. Explain the Applet tags with example. **(04 Marks)**

b. Write an Applet program to create a Banner Applet that displays "Java makes the web move!". **(06 Marks)**

c. Explain the usage of JLabel, ImageIcon and JButton swing components. **(06 Marks)**

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15CS46

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Data Communications

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is data communication? Discuss different criterias necessary for an effective and efficient network. **(04 Marks)**

b. Assume eight devices are arranged in a mesh topology how many cables are needed? How many ports are needed for each device? **(02 Marks)**

c. Explain the layers in TCP/IP protocol suit. **(08 Marks)**

d. If a peak voltage of a signal is 20 times the peak voltage of the noise what is SNR and SNR_{dB}. **(02 Marks)**

OR

2 a. Explain different causes for transmission impairment. **(06 Marks)**

b. Draw the graph of NRZ-L, NRZ-I and Bipolar schemes using the following data stream 0101100. **(04 Marks)**

c. Bringout the major difference between TCP/IP and OSI model. **(03 Marks)**

d. What is the total delay for a frame of size 5 million bits that is being sort on a link with 10 routers each having a queuing time of 2μs and processing time of 1μs. The length of the link is 2000km, the speed of the light inside the link is 2×10^8m/s. The link has a bandwidth of 5Mbps. **(03 Marks)**

Module-2

3 a. With a neat diagram, explain the most common technique to change analog signal to digital data. **(09 Marks)**

b. In a digital transmission the sender clock is 0.3 percent faster than the receiver clock. How many extrabits per second does the sender send if the data rate is 1 Mbps. **(03 Marks)**

c. Explain different aspects of analog to digital conversion. **(04 Marks)**

OR

4 a. List out basic multiplexing techniques. Explain any one in detail. **(05 Marks)**

b. Explain the concept of Direct sequence spread spectrum. **(04 Marks)**

c. With neat diagram, explain virtual circuit networks. **(05 Marks)**

d. We have an available bandwidth of 100kHz which spans from 200 to 300kHz. What should be carrier frequency and the bit rate if we modulated our data by using FSK with d = 1? **(02 Marks)**

Module-3

5 a. Given dataword 101001111 and devisor 10111, show the generation of CRC codeword at the sender site. **(06 Marks)**

b. Bit stuff the following frame payload 000111110000111110100011111101111000111 **(03 Marks)**

c. With neat diagram, explain point-to-point protocol frame format. **(05 Marks)**

d. Prove that the code represented by the following codewords is not linear: [(00000), (01011), (10111), (11111)] **(02 Marks)**

OR

6 a. Explain flow diagram for stop and wait protocol. **(05 Marks)**

b. With neat diagram explain different frame types available in HDLC. **(06 Marks)**

c. Assume a packet is made any of four 16 bit words $(466F)_{16}$, $(726F)_{16}$, $(757A)_{16}$ and $(616E)_{16}$. Find the sender site check sum using traditional checksum algorithm. **(05 Marks)**

Module-4

7 a. Explain different persistence methods. **(06 Marks)**

b. What are orthogal sequences give their properties. **(03 Marks)**

c. We have pure ALOHA network with 100 stations. If T_{fr} is 1μs. What is the number of frames each station can send to achieve the maximum efficiency? **(02 Marks)**

d. Explain Ethernet frame format. **(05 Marks)**

OR

8 a. Discuss hidden station problem. **(06 Marks)**

b. Explain with a neat diagram MAC layer frame format. **(06 Marks)**

c. What is Bluetooth, explain any one Bluetooth network. **(04 Marks)**

Module-5

9 a. Draw a cell pattern with frequency reuse factor of 5. **(02 Marks)**

b. What is WIMAX discuss different services it provides to the subscribers. **(07 Marks)**

c. An organization is assigned the block 2000:1456:2474/48. What is the CIDR notation for the block in the first and second subnet in this organization? **(02 Marks)**

d. List major strategies involved in transition from IPV4 to IPV6, explain any two in detail. **(05 Marks)**

OR

10 a. Explain IPV4 datagram format. **(08 Marks)**

b. With the help of flow diagram discuss how mobile host and remote host communicates in mobile I_p. **(06 Marks)**

c. According to Kepleri law, what is the period of satellite that is located at an orbit approximately 35,786km? **(02 Marks)**

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18CS32

Third Semester B.E. Degree Examination, Aug./Sept.2020
Data Structures and Applications

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define data structures. List and explain the different operations that can be carried on arrays. **(10 Marks)**

b. Define pointers. List the advantages of pointers over arrays. **(04 Marks)**

c. Define dynamic memory allocation. List and write with explanation the syntax of dynamic memory allocating functions. **(06 Marks)**

OR

2 a. Define strings. List and explain any 5 operations with example. **(12 Marks)**

b. Is it possible to store the contents of an array into a points? Justify your opinion and with suitable C-statements. **(08 Marks)**

Module-2

3 a. Define a stack. Explain the different operation that can be performed on stack using C-functions and show them using diagrammatic representations. **(10 Marks)**

b. Write an algorithm to convert a parenthesized infix expression to postfix. Apply the algorithm and show the contents of stack during conversion for the expression : (A + B * C) * ((D + E – F)/J). **(07 Marks)**

c. Differentiate recursion and iteration process. **(03 Marks)**

OR

4 a. Write a C–recursive function for
i) Adding n-odd natural numbers
ii) Adding n-even natural numbers. **(08 Marks)**

b. Define a queue. List the different types of queues. State the limitation of ordinary queue. Explain how do you overcome the limitation by specifying the required C-statements and diagrammatic representation using an example. **(12 Marks)**

Module-3

5 a. With the C–statements, explain how do you create a node, add and delete on Singly Linked List (SLL) with proper message where each node is containing the details of employee in the form of EmpId, EmpName, Empaddr and Empsalary as data fields. **(10 Marks)**

b. Write and explain how do you implement the operations of stack using Singly Linked List (SLL) with the help of C–statements. **(10 Marks)**

OR

6 a. Differentiate Single (SLL) and Doubly (DLL) linked lists. **(04 Marks)**

b. State the advantage of Doubly Linked List over Singly Linked List. **(02 Marks)**

c. Implement addition and deletion of a NODE on a Doubly Linked List (DLL) with required C–statements. **(14 Marks)**

Module-4

7 a. Define a binary tree. Explain how do you construct and add a NODE to binary tree using C–statements. Also explain how do you represent a binary tree using arrays. **(09 Marks)**

b. Define binary tree traversal method. List and explain the different binary tree traversal methods along with C–functions. **(08 Marks)**

c. Find the INORDER, PREORDER and POSTORDER for the following :

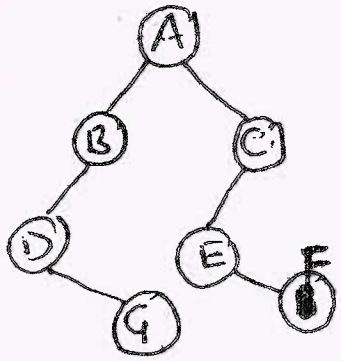

Fig.Q7(c) **(03 Marks)**

OR

8 a. Define expression tree. Using a C–function, explain how do you construct a expression tree. Construct an expression tree for : a + b * c/f^g – h. **(10 Marks)**

b. With diagrammatic explanation, explain how do you create and construct a BST. Also write C–functions for the same. **(10 Marks)**

Module-5

9 a. Define a graph and its traversal methods. List and explain the different graph traversal methods. Find the resultants of the types of graph traversal methods on the following graph : (consider 'a' as starting vertex).

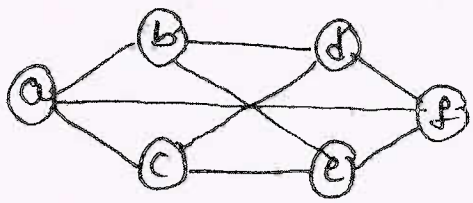

Fig.Q9(a) **(12 Marks)**

b. Write address calculation sort algorithm. Sort Z, A, P, B, Q, I, J, K using the address calculation sort algorithm. **(08 Marks)**

OR

10 a. Define file. List basic file operations. Explain any four operations with syntax and example. **(10 Marks)**

b. Define Hashing. Explain the method of sorting data using a Hash function in a Hash table. Identify the problem that occurs during the value storage. Explain how do you resolve the problem using Hashing technique. **(10 Marks)**

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18CS33

Third Semester B.E. Degree Examination, Aug./Sept.2020
Analog and Digital Electronics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With a neat diagram, explain the working principle of photocoupler. **(08 Marks)**

b. List the different types of BJT biasing. Derive the expression for collector emitter voltage (V_{CE}) for fixed bias circuit. **(08 Marks)**

c. Write a note on light emitting diode. **(04 Marks)**

OR

2 a. Explain with neat diagram, the construction, working principle and characteristics equation of photodiode. **(08 Marks)**

b. With a neat waveform and circuit diagram, explain the working of monostable multivibrator. **(06 Marks)**

c. Explain with neat diagram R-2R ladder type DAC and derive the expression for V_0. **(06 Marks)**

Module-2

3 a. Minimize the following function for SOP using K-map and implement it using basic gates:
$f(a,b,c,d) = \Pi M(5,7,13,14,15) + d(1,2,3,9)$ **(06 Marks)**

b. Design the function EX-OR using (i) NAND gates only (ii) NOR gates only **(06 Marks)**

c. A switching circuit has two control inputs (C_1 and C_2), two data inputs (X_1 and X_2) and one output Z. The circuit performs one of the logic functions such as OR, XOR, AND, EQU for control inputs combination C_1, C_2 as 00, 01, 10, 11 respectively:
(i) Derive the truth table for Z
(ii) Use a K-map to find minimum AND-OR gate circuit to realize Z. **(04 Marks)**

OR

4 a. Minimize the following function for POS using Kmap and realize it by using basic gates:
$f(a,b,c,d) = \Pi M(0,1,6,8,11,12) + d(3,7,4,15)$ **(06 Marks)**

b. Plot the following function on a K-map (Do not expand to minterm before plotting):
$F(A,B,C,D) = \overline{A}\,\overline{B} + C\overline{D} + ABC + \overline{A}\,\overline{B}C\overline{D} + ABC\overline{D}$, find the minimum sum of products. **(06 Marks)**

c. A digital system is to be designed in which the month of the year is given as I/P is four bit form. The month January is represented as '0000', February as '0001' and so on. The output of the system should be '1' corresponding to the input of the month containing 31 days or otherwise it is '0'. Consider the excess number in the I/P beyond '1011' as don't care condition:
(i) Write truth table, SOP Σm and POSΠM form
(ii) Simplify for SOP using K-map
(iii) Realize using basic gates **(08 Marks)**

Module-3

5 a. Explain with neat diagram static hazard 0 and its recover method. **(06 Marks)**

b. Implement the following function using $3 \times 4 \times 2$ PLA:
$A(x,y,z) = \sum m(0,1,3,4)$; $B(x,y,z) = \sum m(1,2,3,4,5)$ **(08 Marks)**

c. Using EVM method simplify the following function and implement it by using 8:1 MUX
$F(a, b, c, d) = \Sigma m(0, 1, 2, 4, 5, 6, 9, 10, 12, 13, 14, 15)$ **(06 Marks)**

OR

6 a. With a neat diagram, explain 3 to 8 line decoder. **(04 Marks)**

b. Construct 32:1 MUX using 8:1 MUX and 2:4 decoder. **(08 Marks)**

c. Design 7 segment decoder and realize using PLA. **(08 Marks)**

Module-4

7 a. Explain with a neat diagram, VHDL program structure. **(06 Marks)**

b. Construct SR gates latch using NAND gates and derive the characteristics equation for the same. **(08 Marks)**

c. Explain T-flipflop with characteristics equation. **(06 Marks)**

OR

8 a. Explain with neat diagram, working of JK flipflop and derive its characteristic equation. **(08 Marks)**

b. Write VHDL code for 4 bit adder. **(06 Marks)**

c. Explain the application of SR latch in switch debouncing technique. **(06 Marks)**

Module-5

9 a. With neat diagram, explain 4 bit parallel adder with accumulator. **(08 Marks)**

b. With diagram explain 4 bit SISO register. **(08 Marks)**

c. Write a note on Johnson tail counter. **(04 Marks)**

OR

10 a. Design Mod 5 counter using JK flipflops. **(10 Marks)**

b. Explain 4 bit PIPO shift register with block diagram. **(06 Marks)**

c. Write a note on ring counter. **(04 Marks)**

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18CS34

Third Semester B.E. Degree Examination, Aug./Sept.2020
Computer Organization

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. With a neat diagram, analyze the basic operational concepts of a computer. Give the operating steps. **(10 Marks)**

b. Analyze Big Endian and Little Endian methods of byte addressing with proper example. **(05 Marks)**

c. Explain SPEC rating of computer. **(05 Marks)**

OR

2 a. What is an Addressing mode? Explain any four types of addressing modes, with suitable example. **(10 Marks)**

b. What is a Subroutine? Analyse the use of call (or) Return Instructions in a subroutine with assembly language program code. **(10 Marks)**

Module-2

3 a. With neat sketches, explain various methods for handling multiple Interrupts requests raised by Multiple devices. **(10 Marks)**

b. What is DMA Bus Arbitration? Briefly explain different bus arbitration techniques. **(10 Marks)**

OR

4 a. Explain Synchronous Bus and Asynchronous Bus with neat Timing diagrams. **(10 Marks)**

b. Enumerate the features of Universal Serial Bus. **(05 Marks)**

c. Describe how a read operation is performed in a PCI bus. **(05 Marks)**

Module-3

5 a. With a neat diagram, explain the Internal Organization of 128 × 8 memory chip. **(10 Marks)**

b. Describe the working of Static RAM memories. **(05 Marks)**

c. Analyze the working mechanism of Asynchronous DRAMS. **(05 Marks)**

OR

6 a. Analyze how data are written into Read Only Memories (ROM). Discuss different types of Read Only Memories. **(10 Marks)**

b. What is Cache memory? Analyze the three mapping functions of Cache memory. **(10 Marks)**

Module-4

7 a. Design a logic circuit to perform addition and subtraction of two 'n' – bit numbers X and Y. This circuit can be suitably modified to perform Y – X operation. **(08 Marks)**

b. Design an 'n' bit carry propagation adder circuit to add 'K' – 'n' bit numbers. **(07 Marks)**

c. Subtract – 5 from -7 using Two's complement subtraction. **(05 Marks)**

OR

8 a. Analyze the design of Carry Look Ahead adder circuit suitable logic circuit diagram. **(10 Marks)**

b. Explain Booth Multiplication Algorithm. Apply Booth Multiplication Algorithm to multiply the signed number – 5 and 4. **(10 Marks)**

Module-5

9 a. Explain the working of single bus organization of data path. **(07 Marks)**

b. Write the sequence of control steps to execute the Instruction Add (R_3) , R_1 on single bus architecture. **(05 Marks)**

c. Analyze how does execution of a complete instruction carry out. **(08 Marks)**

OR

10 a. What is the purpose of Control unit? With neat sketches, explain the organization of Hardwired control unit in detail. **(10 Marks)**

b. What is Pipelining? Explain the five stage Instruction pipeline with timing diagram. **(10 Marks)**

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18CS35

Third Semester B.E. Degree Examination, Aug./Sept.2020
Software Engineering

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define Software Engineering. Bring out the differences between generic and bespoke software. List Software Engineering attributes. **(10 Marks)**

b. Explain Incremental Development process model with a neat block diagram. List its benefits and problems. **(10 Marks)**

OR

2 a. Illustrate Requirement Engineering process with a neat block diagram. **(10 Marks)**

b. Explain the IEEE standard requirement document with its structure. **(10 Marks)**

Module-2

3 a. Define object orientation, list and explain the aspects of object oriented approach. **(10 Marks)**

b. List and explain the object oriented theories which supports object oriented technology. **(10 Marks)**

OR

4 a. Briefly explain Links, Associations, Ordering, Bags and Sequences with an example each. **(10 Marks)**

b. Explain Generalization and Inheritance with an example each. **(10 Marks)**

Module-3

5 a. What is system modeling? Explain the different perspective that the system model developed. **(10 Marks)**

b. Illustrate sequence diagram with an example to view patient information. **(10 Marks)**

OR

6 a. Explain Event-driven model with a state diagram of microwave oven application. **(10 Marks)**

b. Define design patterns. Briefly explain the essential elements of design patterns. **(10 Marks)**

Module-4

7 a. Discuss Test Driven Development (TDD) with its process and list its benefits. **(10 Marks)**

b. Explain software evolution process with neat block diagram. **(10 Marks)**

OR

8 a. Discuss Lehuran's laws of program evolution dynamics. **(10 Marks)**

b. Explain Reengineering process with a neat block diagram. **(10 Marks)**

Module-5

9 a. Discuss project plan. Explain the various section of project plan. **(10 Marks)**

b. With a neat diagram explain project scheduling process. **(10 Marks)**

OR

10 a. Discuss software quality and its attributes. Explain process based quality. **(10 Marks)**

b. Explain software reviews and inspections of Quality Assurance. **(10 Marks)**

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18CS36

Third Semester B.E. Degree Examination, Aug./Sept.2020
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define proposition, tautology, contradiction. Determine whether the following compound statement is a tautology or not.

$\{ (p \vee q) \rightarrow r \} \leftrightarrow \{ \neg r \rightarrow \neg(p \vee q)\}$ **(06 Marks)**

b. Using the laws of logic, show that

$(p \rightarrow q) \wedge [\neg q \wedge (r \vee \neg q)] \Leftrightarrow \neg(q \vee p)$ **(07 Marks)**

c. Establish the validity of the following argument :

$\forall x, p(x) \vee q(x)$

$\exists x, \neg p(x)$

$\forall x, \neg q(x) \vee r(x)$

$\forall x, s(x) \rightarrow \neg r(x)$

$\therefore \exists x, \neg s(x)$ **(07 Marks)**

OR

2 a. Define Converse, Inverse and Contrapositive of a conditional. Find converse, inverse and contrapositive of $\forall x, (x > 3) \rightarrow (x^2 > 9)$, where universal set is R. **(06 Marks)**

b. Test the validity of the following arguments:

(i) If there is a strike by students, the exam will be postponed but the exam was not postponed

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$\therefore$ there was no strike by students

(ii) If Ram studies, then he will pass in DMS. If Ram doesn't play cricket, then he will study. Ram failed in DMS.

$\therefore$ Ram played cricket **(06 Marks)**

c. Let $p(x) : x \geq 0$

$q(x) : x^2 \geq 0$ and $r(x) : x^2 - 3x - 4 = 0$, then

for the universe completing of all real numbers, find the truth value of

(i) $\exists x \{p(x) \wedge q(x)\}$ (ii) $\forall x \{p(x) \rightarrow q(x)\}$ (iii) $\exists x \{\phi(x) \wedge r(x)\}$ **(06 Marks)**

d. Define dual of logical statement. Write the dual of the statement

$(p \vee T_o) \wedge (q \vee F_o) \vee (r \wedge s \wedge T_o)$ **(02 Marks)**

Module-2

3 a. Define well ordering principle and prove the following by mathematical induction.

(i) $1^2 + 3^2 + 5^2 + \ldots\ldots..(2n-1)^2 = \dfrac{n(2n-1)(2n+1)}{3}$

(ii) $1*3 + 2*4 + 3*5 + \ldots\ldots + n(n+2) = \dfrac{n(n+1)(2n+7)}{6}$ **(12 Marks)**

b. Find the coefficients of

(i) x^9y^3 in the expansion of $(2x - 3y)^{12}$

(ii) $a^2b^3c^2d^5$ in the expansion of $(a + 2b - 3c + 2d + 5)^{16}$ **(08 Marks)**

OR

4 a. Prove that for any positive integer n,

$$\sum_{i=1}^{n} \frac{f_{i-1}}{2^i} = 1 - \frac{f_{n+2}}{2^n}$$, f_n denote the Fibonacci number. **(06 Marks)**

b. Determine the coefficient of xyz^2 in the expansion of $(2x - y - z)^4$. **(07 Marks)**

c. How many positive integers n, can we form using the digits 3, 4, 4, 5, 5, 6, 7, if we want n to exceed 5,000,000? **(07 Marks)**

Module-3

5 a. If A = {1, 2, 3, 4, 5} and there are 6720 injective functions f : A → B, what is | B |? **(03 Marks)**

b. Six books each of Physics, Chemistry, Mathematics and four books of Biology totally contains 12225 pages. Find the least number of pages contained in a book. **(05 Marks)**

c. The set A = {1, 3, 4, 7, 9} and B = {2, 4, 6, 7, 8} and f : R → R is given by f(x) = 2x + 5. Verify the following results for

(i) $f(A \cup B) = f(A) \cup f(B)$

(ii) $f^{-1}(A \cup B) = f^{-1}(A) \cup f^{-1}(B)$

(iii) $f^{-1}(A \cap B) = f^{-1}(A) \cap f^{-1}(B)$ **(12 Marks)**

OR

6 a. Let A = { 1, 2, 3, 6, 9, 12, 18 } and define R on A by xRy if "x divides y". Draw the Hasse diagram for the poset (A, R). Also write the matrix of relation. **(08 Marks)**

b. Consider poset whose Hasse diagram is given below. Consider B = {3, 4, 5}. Find the upper and lower bounds of B, least upper bound and greatest lower bound of B (Refer Fig.Q6(b)).

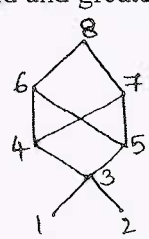

Fig.Q6(b) **(04 Marks)**

c. Let f, g, h : R→R where f(x) = x^2, g(x) = x + 5 and h(x) = $\sqrt{x^2+2}$. Show that (h o g) o f = h o (g o f). **(08 Marks)**

Module-4

7 a. In how many ways can the 26 letters of English alphabet be permuted so that none of the patterns CAR, DOG, PUN or BYTE occurs? **(08 Marks)**

b. There are eight letters to eight different people to be placed in eight different addressed envelopes. Find the number of ways of doing this so that atleast one letter gets to right person. **(04 Marks)**

c. Solve the recurrence relation $a_n - a_{n-1} - 12(n+1)^3$, $n \geq 1$, $a_0 = 3$. **(08 Marks)**

OR

8 a. A person invests some amount at the rate of 11% annual compound interest. Determine the period for this principal amount to get doubled. **(06 Marks)**

b. How many permutations of 1, 2, 3, 4, 5, 6, 7, 8 are not dearrangements? **(07 Marks)**

c. Find the rook polynomial for 3×3 board using the expansion formula. **(07 Marks)**

Module-5

9 a. Merge sort the list –1, 7, 4, 11, 5, –8, 15, –3, –2, 6, 10, 3. **(06 Marks)**

b. Determine whether the following graphs are isomorphic or not. [Refer Fig.Q9(b)]

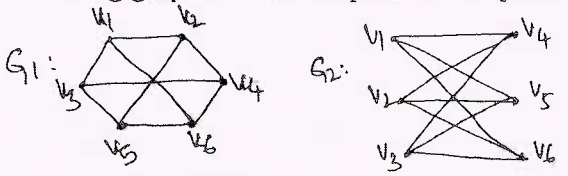

Fig.Q9(b) **(06 Marks)**

c. Define the following with an example to each :
(i) Simple graph (ii) Complete graph (iii) Tree (iv) Regular graph
(v) Spanning subgraph (vi) Induced sub graph (vii) Complete Bipartite graph
(viii) Complement of graph. **(08 Marks)**

OR

10 a. Let G : (V, E) be a connected undirected graph, what is the largest possible value for |V| if |E| = 19 and deg(V) ≥ 4 for all v ∈ V? **(06 Marks)**

b. Construct an optional prefix code for the letters of the word ENGINEERING. Hence deduce the code for this word. **(08 Marks)**

c. T : (V, E) is a complete m-ary tree with | V | = n, if T has ℓ leaves and i internal vertices, prove the following results:
(i) $n = mi + 1$
(ii) $\ell = (m - 1)i + 1$
(iii) $i = \frac{\ell - 1}{m - 1} = \frac{n - 1}{m}$ **(06 Marks)**

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CBCS SCHEME

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17CS36

Third Semester B.E. Degree Examination, Aug./Sept.2020
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Let p and q be primitive statements for which the conditional $p \rightarrow q$ is false. Determine the truth value of the following compound propositions $p \wedge q$, $\neg p \vee q$, $q \rightarrow p$, $\neg q \rightarrow \neg p$ **(07 Marks)**

b. Show that SVR is a tautology implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$ using rules of inference. **(07 Marks)**

c. Define Converse, Inverse and Contra positive with an illustration. **(06 Marks)**

OR

2 a. Define tautology. Show that for any proposition p, q, r the compound propositions $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology. **(06 Marks)**

b. Prove the following logical equivalence $\{(p \rightarrow q) \wedge [\neg q \wedge (r \wedge \neg q)]\} \Leftrightarrow \neg(q \vee p)$ **(07 Marks)**

c. Find whether the following argument is valid or not.
If a triangle has 2 equal sides, then it is isosceles
If a triangle is isosceles, then it has 2 equal angles
A certain ΔABC does not have 2 equal angles
$\therefore$ The ΔABC does not have 2 equal sides. **(07 Marks)**

Module-2

3 a. Prove by mathematical induction that, for all integer $n \geq 1$.

$$1 + 2 + 3 + \ldots\ldots\ldots\ldots + n = \frac{1}{2} n(n+1)$$ **(08 Marks)**

b. The Fibonacci numbers are designed recursively by $F_0 = 0$, $F_1 = 1$, $F_n = F_{n-1} + F_{n-2}$ for $n \geq 2$. Evaluate F_2 to F_{10}. **(04 Marks)**

c. Find the number of permutations of the letters of the word MASSASAUGA. In how many of these, all 4 A's are together? How many of them begin with S? **(08 Marks)**

OR

4 a. Prove by mathematical induction that $1^2 + 3^2 + 5^2 + \ldots\ldots\ldots + (2n-1)^2 = \frac{1}{3} n(2n-1)(2n+1)$ for all integers $n \geq 1$. **(08 Marks)**

b. The Lucas number's are defined recursively by $L_0 = 2$, $L_1 = 1$ and $L_n = L_{n-1} + L_{n-2}$ for $n \geq 2$. Evaluate L_2 to L_{10} **(06 Marks)**

c. There are four bus routes between the places A and B, three bus routes between the places B and C. Find the number of ways a person can make a round trip from A to C via B, if he does not use a route more than once. **(06 Marks)**

Module-3

5 a. Let $f : R \rightarrow R$ be defined by $f(x) = \begin{cases} 3x - 5 & \text{for } x > 0 \\ -3x + 1 & \text{for } x \leq 0 \end{cases}$

Determine f(0), f(-1), f(5/3), $f^{-1}(-1)$, $f^{-1}(-3)$, $f^{-1}(6)$, $f^{-1}([-5, 5])$. **(07 Marks)**

b. ABC is an equilateral triangular, whose sides are of length 1 cm each. If we select 5 points inside the triangle, prove that atleast two of these points are such that the distance between then is less than ½ cm. **(06 Marks)**

c. Let A = {1, 2, 3, 4} and R be a relations on A defined by xRy if and only if "x divides y", written x/y. Write down R as a set of order pairs, draw the diagraph of R and determine indegree and outdegree of the vertices of the graph. **(07 Marks)**

OR

6 a. State pigeon hole principle. A bag contains 12 pairs of socks (each pair in different color). If a person drawn the socks one by one at random, determine atmost how many draws are required to get atleast one pair of matched socks. **(05 Marks)**

b. Let f, g, h be functions from z to z defined by $f(x)= x - 1, g(x)= 3x$, $h(x) = \begin{cases} 0 & \text{if x is even} \\ 1 & \text{if x is odd} \end{cases}$

Determine (fo(goh))(x) and ((fog)oh)(x) and verify that fo(goh) = (fog)oh. **(07 Marks)**

c. Let, R = {(1, 1), (1, 2), (1, 3), (1, 4), (2, 4), (2, 2), (3, 3), (4, 4)} be relation, verify that R is a partial ordering relation or not. If yes, draw the Hasse diagram for R. **(08 Marks)**

Module-4

7 a. Determine the number of positive integers n such that $1 \le n \le 100$ and n is not divisible by 2, 3 or 5. **(07 Marks)**

b. Find the number of derangements of 1, 2, 3, 4 and list them. **(05 Marks)**

c. The number of virus affected files in a system is 1000 (to start with) and this increases by 250% every two hours. Use a recurrence relation to determine the number of virus affected files in the system after one day? **(08 Marks)**

OR

8 a. In how many ways can the 26 letters of the English alphabet be permuted so that none of the patterns CAR, DOG, FUN or BYTE occurs? **(08 Marks)**

b. An Apple, a Banana, a Mango and an Orange are to be distributed to four boys B_1, B_2, B_3, B_4. The boys B_1 and B_2 do not wish to have Apple, the boy B_3 does not want Banana or Mango and B_4 refuses orange. In how many ways the distribution can be made so that no boy is displeased? **(07 Marks)**

c. Solve the recurrence relation

$a_n - 6a_{n-1} + 9a_{n-2} = 0$ for $n \ge 2$, given that $a_0 = 5$, $a_1 = 12$. **(05 Marks)**

Module-5

9 a. Define Isolated vertex, complete graph, Trail path with example. **(06 Marks)**

b. Explain Konigsberg bridge problem. **(07 Marks)**

c. Using the mergesort method, sort the list

7, 3, 8, 4, 5, 10, 6, 2, 9 **(07 Marks)**

OR

10 a. If G(V, E) is a simple graph, prove that

$2|E| \le |V|^2 - |V|$ **(06 Marks)**

b. Prove that a tree with n vertices has n – 1 edges. **(06 Marks)**

c. Obtain the prefix code represented by the following labeled complete binary tree shown in Fig.Q10(c) and also find the code for the words abc, cdb, bde. **(08 Marks)**

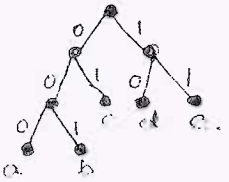

Fig.Q10(c)

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CBCS SCHEME

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15CS32

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Analog and Digital Electronics

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the working of N-channel E-MOSFET, with the help of neat diagram. **(08 Marks)**

b. With the circuit diagram explain any four applications of FET. **(08 Marks)**

OR

2 a. Explain the performance parameters of op-amp. **(08 Marks)**

b. Explain Relaxation Oscillator with diagram. **(08 Marks)**

Module-2

3 a. Simpify following Boolean functions using k-map method.

i) $F(A, B, C, D) = \pi M (0, 1, 2, 4, 5, 10) + d(8, 9, 11, 12, 13, 15)$

ii) $F(A, B, C, D) = \sum m (0, 2, 3, 8, 10, 11, 12, 14)$ **(08 Marks)**

b. Explain Universal gates in brief. **(08 Marks)**

OR

4 a. What is Hazard? Explain its types with example. **(08 Marks)**

b. Apply QUINE-McClusky method to find prime implecants for the Boolean expression $F(A, B, C, D) = \sum m(1, 2, 8, 9, 10, 12, 13, 14)$. **(08 Marks)**

Module-3

5 a. Define Multiplexer, List types of multiplers Implement the following function using 4 to 1 Mux $f(a, b, c) = \sum m (0, 4, 5, 6)$ **(08 Marks)**

b. Define decoder, Implement 3-8 decoder for the expression $F(A, B, C) = \sum m(2, 4, 5, 7)$. **(08 Marks)**

OR

6 a. Design Seven Segment decoder using PLA. **(08 Marks)**

b. Design Full adder circuit. **(08 Marks)**

Module-4

7 a. Explain the working of JK Master – Slave flip-flop with diagram. **(08 Marks)**

b. Draw the state transition table of J-K, SR, T and D-flip-flops. **(08 Marks)**

OR

8 a. Explain Ring and Johnson counter with diagram. **(08 Marks)**

b. What is Shift Register? With neat diagram, explain the serial in parallel out Shift Register. **(08 Marks)**

Module-5

9 a. Define Counter, Design and implement a MOD – 6 synchronous counter using J-K flip-flop. **(08 Marks)**

b. With neat diagram, explain Digital clock **(08 Marks)**

OR

10 a. Explain with circuit diagram, decade counter. **(08 Marks)**

b. Explain 2-bit Simultaneous A/D converters. **(08 Marks)**

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CBCS SCHEME

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15CS33

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Data Structures and Applications

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Differentiate between structures and unions. **(04 Marks)**

b. Write function to:
(i) Insert an element into an array.
(ii) Delete an element from an array. **(06 Marks)**

c. Explain dynamic memory allocation in detail. **(06 Marks)**

OR

2 a. Define data structure. Give its classification. **(06 Marks)**

b. Consider the following polynomial:
$A(x) = 4x^{15}+3x^4+5$ and $B(x) = x^4 + 10x^2 + 1$
Show diagrammatically how these two polynomials can be stored in a 1-D array. Also give its C representation. **(04 Marks)**

c. Give the ADT of sparse matrix and show with suitable example. Sparse matrix representation storing as triplet. **(06 Marks)**

Module-2

3 a. Define stack. Implement push and pop functions for stack using arrays. **(08 Marks)**

b. Write the postfix form of the following expression using stack:
(i) $((6+(3-2)\times 4)\$5+7)$
(ii) $(a+b)*d+e/(f+a*d)+c$ **(08 Marks)**

OR

4 a. List the disadvantages of linear queue and how is it solved in circular queue. Give the algorithm to insert and delete an element in a circular queue. **(08 Marks)**

b. Write a function to evaluate postfix expression and convert the following expression to postfix expression and trace for the given data a = 6, b = 3, c = 1, d = 2, e = 4.
$((a/(b-c+d))*(e-a)*c)$. **(08 Marks)**

Module-3

5 a. Write the following function for singly linked list,
(i) insert front (ii) delete end **(08 Marks)**

b. List out the difference between the doubly linked list and singly linked list. Explain with example the following operations on doubly linked list.
(i) Insert a node at the beginning.
(ii) Deleting a node with given value. **(08 Marks)**

OR

6 a. Define linked list. Explain in detail the primitive operation performed on singly linked list. **(08 Marks)**

b. Write C program to implement linked stack. **(08 Marks)**

Module-4

7 a. What is tree? With suitable example define
(i) Binary tree (ii) Level of tree (iii) Complete binary tree. **(08 Marks)**

b. Draw the binary tree for the following expression $3+4*(7-6)/4+3$. Traverse the generated tree using inorder, postorder and preorder. **(08 Marks)**

OR

8 a. Given inorder : DJGBHEAFKIC and
Postorder : JGDHEBKITCA construct binary tree and give its preorder traversal. **(08 Marks)**

b. Write a function to insert an item into an ordered binary search tree (Duplicate item not allowed). **(08 Marks)**

Module-5

9 a. Define graph. Give adjacency matrix and adjacency linked list for the given weighted graph in Fig. Q9 (a). **(08 Marks)**

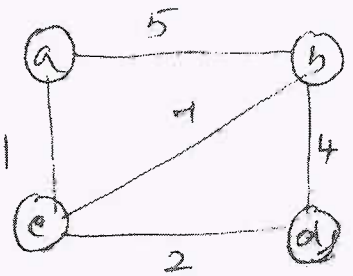

Fig. Q9 (a)

b. What are the methods used for traversing the graph. Explain one with example. **(08 Marks)**

OR

10 a. How insertion sort works? Trace the insertion sort algorithm for the following data in ascending order:
77, 33, 44, 11, 88, 22, 66, 55 **(08 Marks)**

b. What is collision? What are the methods used to resolve collision? Explain linear probing with an example. **(08 Marks)**

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CBCS SCHEME

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15CS34

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Computer Organization

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. How to measure the performance of a computer? Explain. **(05 Marks)**

b. What are the four types operations required by the instruction to be performed by the computer? Explain the basic instruction types with an example. **(06 Marks)**

c. Explain the concept of stack frames when subroutines are nested. **(05 Marks)**

OR

2 a. What is performance measurement? Explain the SPEC rating for the computer in a program. **(07 Marks)**

b. Explain with examples, any three generic addressing modes with assembler syntax. **(09 Marks)**

Module-2

3 a. Discuss the interrupt priority with daisy chain and in the priority groups. **(05 Marks)**

b. With the typical block diagram of a DMA controller and explain how it is used of direct data transfer between memory and peripherals. **(06 Marks)**

c. With a neat figure, explain a general 8 bit parallel interface circuit. **(05 Marks)**

OR

4 a. Explain neatly the bus arbitration methods. **(05 Marks)**

b. Show how DMA transfer is accomplished with a neat sketch. **(06 Marks)**

c. Explain SCSI bus data transfer in a computer system. **(05 Marks)**

Module-3

5 a. Explain the organization of 1K × 1 memory chip. **(05 Marks)**

b. Illustrate cache memory mapping functions. **(06 Marks)**

c. Explain Virtual memory address translations. **(05 Marks)**

OR

6 a. Explain the direct mapped cache in mapping functions with a neat diagram. **(08 Marks)**

b. What is memory interleaving? Explain with a suitable example. **(08 Marks)**

Module-4

7 a. Explain 4-bit carry-look ahead adder with a neat diagram. **(06 Marks)**

b. Perform the addition and subtraction of following signed number (Any two)

i) +2 and +3 (Addition)
ii) −7 and −5 (Subtraction)
iii) +4 and −6 (Addition)
iv) +7 and −3 (Addition) **(04 Marks)**

c. Perform bit pair recoding for −11 and +27 [(−11) multiplicand and (+27) multiplier]. **(06 Marks)**

OR

8 a. Perform Booth's algorithm for (+15) and (−6) [(+15) Multiplicand (−6) Multiplier] **(08 Marks)**

b. Perform 1100 ÷ 11 using non restoring algorithm. **(08 Marks)**

Module-5

9 a. Explain the Three bus organization of processor. **(08 Marks)**

b. Show with a block diagram an embedded processor and briefly explain. **(08 Marks)**

OR

10 a. Compare and contrast the following :

i) Harwired control

ii) Microprogrammed control **(08 Marks)**

b. Explain the sequence of steps required to execute the following instruction ADD (R3), R_1. **(08 Marks)**

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CBCS SCHEME

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15CS35

Third Semester B.E. Degree Examination, Aug./Sept. 2020
UNIX and Shell Programming

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain the salient feature of UNIX operating system. **(06 Marks)**

b. Give the significance of the seven fields of ℓs–ℓ command. **(06 Marks)**

c. Explain with example internal and external commands of UNIX. **(04 Marks)**

OR

2 a. Briefly explain the UNIX architecture. **(07 Marks)**

b. Explain the following commands with example.
i) echo ii) ℓs iii) who iv) date v) cal. **(05 Marks)**

c. Explain the commands to add and delete user. **(04 Marks)**

Module-2

3 a. Draw the tree structure of the file system created by the following commands (assume you are in the directory/user/office). Why is it not possible to issue the command rmdir/user/office/right.

```
$ mkdir left
$ mdkir middle
$ mkdir right
$ cd left
$ mkdir left middle right
$ cd..../middle
$ mkdir dir1 dir2/user/office/right/dir3.
```

(08 Marks)

b. Which command is used for listing file attributed? Explain briefly the significance of each field of the output. **(08 Marks)**

OR

4 a. What is file permission? Explain how to use "chmod" command to set the permissions in a relative manner with an example. **(08 Marks)**

b. Explain absolute method of changing permissions with example. **(08 Marks)**

Module-3

5 a. Explain "grep" command with all options. **(08 Marks)**

b. Explain 3 standard files with respect to UNIX. **(08 Marks)**

OR

6 a. Define wild card, explain shell wild card. **(06 Marks)**

b. What are Extended Regular Expression (ERE)? Explain any four ERE set used by "grep" and "egrep". **(06 Marks)**

c. Explain shell interpretive cycle. **(04 Marks)**

Module-4

7 a. Distinguish between hard links and soft links with example. **(06 Marks)**

b. Explain the shell features of :
i) while ii) "for" with syntax. **(06 Marks)**

c. Write a shell script to print first 10 numbers (1 to 10). **(04 Marks)**

OR

8 a. Discuss head and tail command along with its options. **(08 Marks)**

b. Explain the following statement with example :
i) "if" ii) while iii) case. **(08 Marks)**

Module-5

9 a. Briefly explain variables and operators in Perl. **(06 Marks)**

b. Explain the following : i) split ii) Join in Perl. **(06 Marks)**

c. Write a PERL script to demonstrate the use of "chop" function. **(04 Marks)**

OR

10 a. Explain mechanism of process creation. **(08 Marks)**

b. Write a Perl script to read letters NEWS from command line and display their abbreviation. **(08 Marks)**

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CBCS SCHEME

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15CS36

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define tautology. Prove that, for any propositions p, q, r the compound proposition

$[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology. **(05 Marks)**

b. Prove the following logical equivalences using laws of logic.

i) $[p \vee q \vee (\sim p \wedge \sim q \wedge r)] \Leftrightarrow (p \vee q \vee r)$

ii) $[(\sim p \vee \sim q) \rightarrow (p \wedge q \wedge r)] \Leftrightarrow p \wedge q$. **(05 Marks)**

c. Find whether the following argument is valid :
No engineering student of first or second semester studies logic.
Anil is an engineering student who studies logic
$\therefore$ Anil is not in second semester **(06 Marks)**

OR

2 a. If a proposition q has the truth value 1, determine all truth value assignments for the primitive propositions p, r and s for which the truth value of the following compound proposition is 1.

$[q \rightarrow \{(\sim p \vee r) \wedge \sim s\}]\{\wedge s \rightarrow (\sim r \wedge q)\}$. **(04 Marks)**

b. Establish the validity of the following arguments :

$\forall x, [p(x) \vee q(x)]$
$\forall x, [\{\sim p(x) \wedge q(x)\} \rightarrow r(x)]$
$\therefore \forall x, [\sim r(x) \rightarrow p(x)]$ **(06 Marks)**

c. Give :
i) A direct proof
ii) An indirect proof
iii) Proof by contradiction for the following statement :
"If n is an odd integer, then n + 9 is an even integer". **(06 Marks)**

Module-2

3 a. If n is any positive integer, prove that $1.2 + 2.3 + 3.4 + \ldots + n(n+1) = \frac{1}{3}n(n+1)(n+2)$, using mathematical induction. **(05 Marks)**

b. A bit is either 0 or 1. A byte is a sequence of 8 bits. Find :
(i) the number of bytes, (ii) the number of bytes that being with 11 and end with 11 (iii) the number of bytes that begin with 11 and do not end with 11 (iv) number of bytes that begin with 11 end with 11. **(06 Marks)**

c. Find the number of arrangements of all the letters in TALLAHASSEE. How many of these arrangements have no adjacent A's. **(05 Marks)**

OR

4 a. Prove by mathematical induction that, for every positive integer n, 5 divides $n^2 - n$. **(05 Marks)**

b. Find an explicit definition of the sequence defined recursively by

$a_1 = 7$, $a_n = 2a_{n-1} + 1$ for $n \geq 2$. **(05 Marks)**

c. In how many ways can one distribute eight identical balls into four distinct containers so that :

i) No container is left empty?

ii) The fourth container gets an odd number of balls. **(06 Marks)**

Module-3

5 a. Let $f : R \to R$ be defined by

$$f(x) = \begin{cases} 3x - 5 \text{ for } & x > 0 \\ -3x + 1 \text{ for } & x \leq 0 \end{cases}$$

Determine : $f(0)$, $f(-5/3)$, $f^{-1}(0)$, $f^{-1}(3)$, $f^{-1}([-5, 5])$. **(06 Marks)**

b. Prove that if 101 integers are selected from the set $S = \{1, 2, 3, \ldots, 200\}$, then at least two of these are such that one divides the other. **(04 Marks)**

c. Let $A = \{1, 2, 3, 4, 5\}$. Define a relation R on $A \times A$ by (x_1, y_1) $R(x_2, y_2)$ if and only if $x_1 + y_1 = x_2 + y_2$.

i) Verify that R is an equivalence relation on $A \times A$

ii) Determine the equivalence classes $[(1, 3)]$, $[(2, 4)]$, $[(1, 1)]$

iii) Determine the partition of $A \times A$ induced by R. **(06 Marks)**

OR

6 a. Suppose that a patient is given a prescription of 45 pills with instructions to take at least one pill a day for 30 days. Prove that there must be a period of consecutive days during which the patient takes a total of exactly 14 pills. **(05 Marks)**

b. Let $f : A \to B$, $g : B \to C$ and $h : C \to D$ be three functions. Then prove that $(h \circ g) \circ f = h \circ (g \circ f)$. **(06 Marks)**

c. For $A = \{a, b, c, d, e\}$, the Hasse diagram for the poset (A, R) is as shown below : (Ref. Fig.Q6(c))

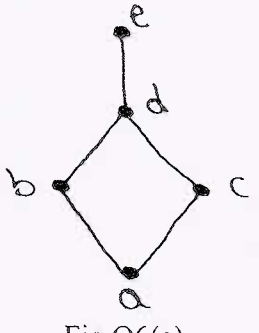


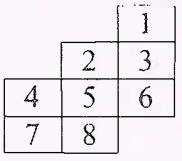
Fig.Q6(c)

Determine the relation matrix for R and construct the digraph for R. **(05 Marks)**

Module-4

7 a. Out of 30 students in a hostel, 15 study history, 8 study economics, and 6 study geography. It is known that 3 students study all these subjects. Show that 7 or more students study none of these subjects. **(05 Marks)**

b. By using the expansion formula, obtain the rook polynomial for the board C shown below :



(05 Marks)

c. There are 3 pegs fixed vertically on a table, and n circular disks having holes at their centers and having increasing diameters are slipped onto one of these pegs, with the largest disk at the bottom. The disks are to be transferred, one at a time, onto another peg with the condition that at no time a larger disk is put on a smaller disk. Determine the number of moves for the transfer of all the n disks, so that at the end the disks are in their original order. **(06 Marks)**

OR

8 a. Determine the number of positive integers n such that $1 \le n \le 100$ and n is not divisible by 2, 3 or 5. **(05 Marks)**

b. Four persons P_1, P_2, P_3, P_4 who arrive late for a dinner party find the that only one chair at each of five tables T_1, T_2, T_3, T_4 and T_5 is vacant. P_1 will not sit at T_1 or T_2, P_2 will not sit at T_2, P_3 will not sit at T_3 or T_4 and P_4 will not sit at T_4 or T_5. Find the number of ways they can occupy the vacant chairs. **(06 Marks)**

c. Solve the recurrence relation $F_{n+2} = F_{nH}$ for $n \ge 0$, given $F_0 = 0$, $F_1 = 1$. **(05 Marks)**

Module-5

9 a. For a graph with n vertices and m edges, if δ is the minimum and Δ is the maximum of the degrees of vertices, show that $\delta \le \frac{2m}{n} \le \Delta$. **(05 Marks)**

b. Define isomorphism. Show that the following two graphs are isomorphic.(Ref. Fig.Q9(b)).

Fig.Q9(b) **(06 Marks)**

c. Prove that a tree with two or more vertices contains at least two leaves (pendant vertices). **(05 Marks)**

OR

10 a. Define each of the following with an example :
i) Regular graph
ii) Bipartite graph
iii) Complete bipartite graph. **(05 Marks)**

b. Suppose that a tree T has N_1 vertices of degree 1, N_2 vertices of degree 2, N_3 vertices of degree 3, . . ., N_K vertices of degree K. Prove that :

$$N_1 = 2 + N_3 + 2N_4 + 3N_5 + \ldots + (K-2)N_K.$$ **(05 Marks)**

c. Construct an optimal prefix code for the symbols a, o, q, u, y, z that occur with frequencies 20, 28, 4, 17, 12, 7 respectively. **(06 Marks)**

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CBCS SCHEME

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17CS43

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define an algorithm. Explain the characteristics of an algorithm. **(04 Marks)**

b. What are Asymptotic notations? List and describe the various asymptotic notations with an example of each. **(08 Marks)**

c. Explain the general plan of mathematical analysis of non-recursive algorithm with an example. **(08 Marks)**

OR

2 a. What is the worst case, best case and average case efficiencies of sequential search? **(04 Marks)**

b. Illustrate mathematical analysis of recursive algorithm for Towers of Hanoi problem. **(08 Marks)**

c. Discuss the important problem types and fundamental data structures. **(08 Marks)**

Module-2

3 a. Discuss how Quick sort algorithm works to sort an array and trace for the following data set. Draw the tree of recursive calls made.

25	91	46	35	11	82	14	55

Derive best case complexity of quick sort algorithm. **(10 Marks)**

b. Obtain the topological sorting for the digraph shown in Fig.Q3(b), using source removal method.

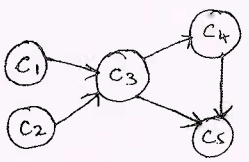

Fig.Q3(b) **(06 Marks)**

c. List out the advantages and disadvantages of divide and conquer technique. **(04 Marks)**

OR

4 a. Explain divide and conquer technique with its control abstraction. **(04 Marks)**

b. Develop an algorithm for sorting elements using Simple merge. Apply the same for sorting list of elements given below:

67	90	12	56	23	34	45

(08 Marks)

c. Apply Strassen's algorithm to compute

$$\begin{bmatrix} 1 & 0 & 2 & 1 \\ 4 & 1 & 1 & 0 \\ 0 & 1 & 3 & 0 \\ 5 & 0 & 2 & 1 \end{bmatrix} * \begin{bmatrix} 0 & 1 & 0 & 1 \\ 2 & 1 & 0 & 4 \\ 2 & 0 & 1 & 1 \\ 1 & 3 & 5 & 0 \end{bmatrix}$$

(08 Marks)

Module-3

5 a. State Job sequencing with deadline problem. Find the solution generated by job sequencing problem for 7 jobs given profits 3, 5, 20, 18, 1, 6, 30 and deadlines 1, 3, 4, 3, 2, 1, 2 respectively. **(04 Marks)**

b. Explain the concept of greedy technique for Prim's algorithm. Obtain a minimum cost spanning tree for the graph below in Fig.Q5(b).

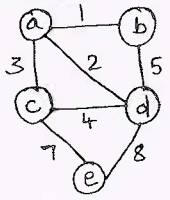

Fig.Q5(b) **(08 Marks)**

c. Sort the given list of number using Heap sort:

2	7	1	6	5	4	3

(08 Marks)

OR

6 a. Explain Greedy criterion. Apply greedy method for the following instance of knapsack problem. Capacity of the knapsack (M) = 5.

Item	Weight	Value
1	2	$12
2	1	$10
3	3	$20
4	2	$15

(08 Marks)

b. Construct a Huffman code for the following data and encode the test BADEC.

Character	A	B	C	D	E
Probability	0.4	0.1	0.2	0.15	0.15

(06 Marks)

c. Solve the below instance (Fig.Q6(c)) of single source shortest path problem with vertex a as the source.

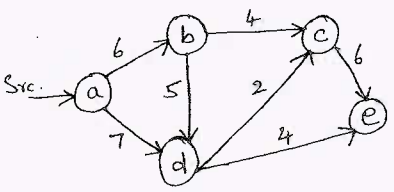

Fig.Q6(c) **(06 Marks)**

Module-4

7 a. What is Dynamic programming? Using Warshall's algorithm, obtain the transitive closure of the graph defined by the following adjacency matrix.

$$R = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

(04 Marks)

b. Define multistage graph problem. Determine the minimum cost path from source (S) to sink (T) for the graph in Fig.Q7(b) using forward approach.

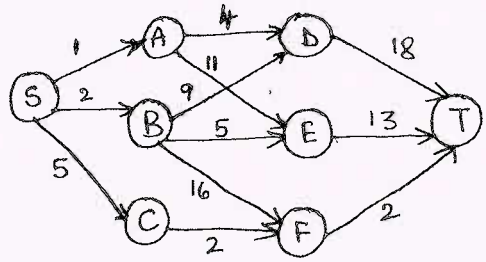

Fig.Q7(b) **(06 Marks)**

c. Solve the below instance of Bellman-Ford algorithm [Fig.Q7(c)].

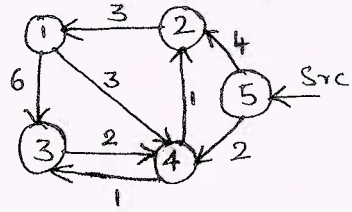

Fig.Q7(c) **(10 Marks)**

OR

8 a. Explain Travelling Salesperson Problem (TSP). Solve the below instance of TSP using dynamic programming.

	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

(08 Marks)

b. Obtain optimal Binary search Tree for the following identifiers.

	1	2	3	4
a[i]	do	if	int	while
p[i]	0.1	0.2	0.4	0.3

(12 Marks)

Module-5

9 a. Draw the state-space tree top generate solutions to 4-Queen's problem. **(04 Marks)**

b. Apply backtracking technique to solve the below instance of the subset sum problem.
$s = \{1, 3, 4, 6\}$ $d = 7$ **(08 Marks)**

c. Apply Branch_and_Bound technique to the following insurance of assignment problem.

$$C = \begin{matrix} \text{job1} & \text{job2} & \text{job3} & \text{job4} \\ \end{matrix}$$
$$\begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix} \begin{matrix} \text{Person a} \\ \text{Person b} \\ \text{Person c} \\ \text{Person d} \end{matrix}$$

(08 Marks)

OR

10 a. How the Branch_and_Bound technique is different from backhacking? Solve the following insurance of knapsack problem using Branch_and_Bound technique. Give knapsack capacity = 10.

Item	1	2	3	4
Weight	4	7	5	3
Valve	40	42	25	12

(08 Marks)

b. Define Hamiltonian cycle. Check whether the Hamiltonian cycle exists for the graph given below in Fig.Q10(b).

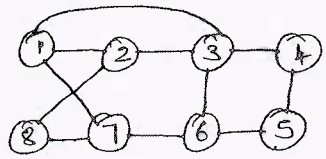

Fig.Q10(b) **(04 Marks)**

c. Define the following :
(i) Class P (ii) Class NP (iii) NP Complete Problem (iv) NP Hard Problem.

(08 Marks)

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17CS44

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Microprocessor and Microcontroller

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain with a neat block diagram basic structure of 8086 microprocessor. **(10 Marks)**

b. Compare 8086, 80486 and Pentium microprocessor. **(05 Marks)**

c. List out the flags of 8086 microprocessor. **(05 Marks)**

OR

2 a. Explain with suitable examples various addressing modes of 8086 microprocessor. **(07 Marks)**

b. What is assembler directive? Explain the following assembler directives.
(i) Program organization directives
(ii) Data definition directives
(iii) Program end directives. **(07 Marks)**

c. Explain the control transfer instructions of 8086 microprocessor or processor control instructions. **(06 Marks)**

Module-2

3 a. Explain the following with an example for each:
(i) DAA (ii) IDIV (iii) ADD (iv) PUSH **(08 Marks)**

b. Write a program to convert 34 and 37 ASCII numbers into packed BCD numbers. **(06 Marks)**

c. Explain the following rotate instructions with suitable examples.
(i) ROL (ii) ROR (iii) RLC (iv) RRC **(06 Marks)**

OR

4 a. Explain the following, with a code of BIOS INT10H programming mode of interrupts.
(i) Clearing the screen
(ii) Sets the cursor at the center of the screen **(06 Marks)**

b. Explain the following DOS interrupts 21H with an example for each.
(i) Int 21H option 09
(ii) Int 21H option 02 **(06 Marks)**

c. Define macro and write the syntax of macro definition for the following functions:
(i) Setting the cursor position
(ii) Display string
(iii) Clearing the screen **(08 Marks)**

Module-3

5 a. What is FlashROM? Explain the functional block diagram of 6116 SRAM. **(06 Marks)**

b. List out at least five differences between SRAM and DRAM. **(05 Marks)**

c. Explain how to access the even and odd words in 8086 microprocessor with a suitable diagram. **(04 Marks)**

d. Explain 74LS138 decoder with a neat diagram. **(05 Marks)**

OR

6 a. Assume that we have 4 bytes of hexadecimal data 25H, 62H, 3FH and 52H.
(i) Find the checksum byte
(ii) Perform the checksum operation to ensure data integrity
(iii) If the second byte 62 has been changed to 22 show the checksum detects the error. **(06 Marks)**

b. Explain each pin of 8255 programmable peripheral interface device with its neat pin diagram. **(10 Marks)**

c. Explain the basic I/O modes of 8255 device. **(04 Marks)**

Module-4

7 a. What is RISC machine? Explain RISC design philosophy. **(06 Marks)**

b. Explain the instruction set for embedded system. **(05 Marks)**

c. Explain with neat sketch AMBA bus protocol. **(05 Marks)**

d. Explain embedded system software. **(04 Marks)**

OR

8 a. Explain ARM core data flow model functional units with suitable diagram. **(07 Marks)**

b. Explain current program status register with a bitwise manipulated operation with a neat sketch. **(05 Marks)**

c. Explain complete ARM register set. **(08 Marks)**

Module-5

9 a. Explain the concept of Barrel shifter with ALU of ARM processor along with logical left shift operation. **(08 Marks)**

b. Explain the following logical instructions of ARM processor with an example.
(i) ORR (ii) BIC (iii) CMP **(06 Marks)**

c. Explain single register transfer instruction of ARM processor. **(06 Marks)**

OR

10 a. List out the addressing methods for stack operations of ARM processor. Explain STMFD instruction of ARM processor. **(07 Marks)**

b. List out and explain SWAP instruction of ARM processor with examples. **(06 Marks)**

c. Explain software interrupt instructions of ARM processor with examples. Explain how SWI handler can be implemented. **(07 Marks)**

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17CS45

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Software Engineering

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is a Software? List and explain Software Engineering Ethics. **(07 Marks)**
b. Explain Boehm's Spiral model with a neat diagram. **(07 Marks)**
c. Explain Ethnography in detail. **(06 Marks)**

OR

2 a. Explain software design process with a neat diagram. **(06 Marks)**
b. Explain various stages of software testing process. **(06 Marks)**
c. Explain interviewing and scenarios. **(08 Marks)**

Module-2

3 a. What is behavioural model? Explain data driven model with a neat diagram. **(07 Marks)**
b. What is a state diagram? Explain the working of microwave oven with a neat diagram. **(06 Marks)**
c. Explain model driven architecture with a neat diagram. **(07 Marks)**

OR

4 a. What is RUP? Explain the phases in rational unified process. **(08 Marks)**
b. What is a pattern? Explain observer pattern. **(06 Marks)**
c. Explain three implementation issues. **(06 Marks)**

Module-3

5 a. State and explain development testing and its three levels unit testing, component testing and system testing. **(07 Marks)**
b. What is test driven development? State the benefits of test driven development. **(07 Marks)**
c. Explain scenario and performance testing. **(06 Marks)**

OR

6 a. With a neat diagram, explain the software evolution process. **(06 Marks)**
b. Explain the Lehman's law concern to the system changes. **(08 Marks)**
c. What is software maintenance? State the activities of reengineering process. **(06 Marks)**

Module-4

7 a. Explain the factors affecting software pricing. **(05 Marks)**
b. Explain project planning process with a neat diagram. **(05 Marks)**
c. List and explain various COCOMO cost estimation model. **(10 Marks)**

OR

8 a. Explain software review process with a neat diagram. **(07 Marks)**
b. What is Program Inspection? Explain inspection check list. **(07 Marks)**
c. What are product metrics? Discuss two classes of product metrics. Explain static software product metrics. **(06 Marks)**

Module-5

9	a.	Explain the ways of coping with changes and reduction of rework cost.	(06 Marks)
	b.	Explain the process of prototype development. What are its benefits?	(08 Marks)
	c.	List and explain the various extreme programming practices.	(06 Marks)

OR

10	a.	What is pair programming? List the advantages of pair programming.	(05 Marks)
	b.	Distinguish between plan driven and agile development with a neat diagram.	(08 Marks)
	c.	Explain SCRUM process with its characteristics.	(07 Marks)

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17CS46

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Data Communication

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define Data Communication. With a neat diagram, explain Network topologies. **(05 Marks)**
b. Explain TCP/IP protocol suite with multiplexing and demultiplexing concepts. **(10 Marks)**
c. Illustrate line coding techniques. Draw a line coding sequence for 010010 using Polar and Bipolar schemes. **(05 Marks)**

OR

2 a. How do you measure the performance of the network? Explain. **(06 Marks)**
b. Explain the Transmission impairments of media. **(09 Marks)**
c. List and explain the Internet Administration. **(05 Marks)**

Module-2

3 a. Write about Pulse Code Modulation (PCM) and discuss the steps involved in the quantization process. **(07 Marks)**
b. Compare and explain Parallel and Serial data transmission modes. **(07 Marks)**
c. Explain Amplitude Shift Keying (ASK). **(06 Marks)**

OR

4 a. What is Multiplexing? Explain the wavelength division multiplexing. **(07 Marks)**
b. Calculate bit rate, if the available bandwidth is 100Khz and which spans from 200 Khz to 300 Khz. Consider ASK with d = 1 and r = 1. **(04 Marks)**
c. What is Spread Spectrum? Explain DHSS bandwidth sharing. **(09 Marks)**

Module-3

5 a. How does data words and code words are represented in block coding and explain how can errors be detected and corrected using block coding? **(10 Marks)**
b. Find the code word using CRC encoder and demonstrate whether the data word is accepted or discarded. The given data is 1001 and the generator is 1011. **(10 Marks)**

OR

6 a. Explain in detail character oriented framing and bit oriented framing with appropriate example. **(10 Marks)**
b. Explain the PPP frame format. **(10 Marks)**

Module-4

7 a. Explain pure ALOHA and Slotted ALOHA with reference to i) Frame time and ii) Vulnerable iii) Throughputs. **(10 Marks)**
b. List and explain any one channelization protocol in detail. **(10 Marks)**

OR

8 a. Explain Gigabit Ethernet design techniques. **(10 Marks)**

b. Illustrate Blue tooth architecture and its types, with a neat figure. **(10 Marks)**

Module-5

9 a. List and explain in detail the types of services provided by the WiMAX. **(10 Marks)**

b. Explain satellite networks and its operations. **(10 Marks)**

OR

10 a. Explain the three phases of mobile host to communication with remote host with a suitable diagram. **(10 Marks)**

b. Illustrate the transition strategies from IPV4 to IPV6. **(10 Marks)**

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17CS/IS32

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Analog & Digital Electronics

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. With circuit symbol and characteristic curves, explain the working of N-Channel E-MOSFET. **(08 Marks)**

b. List out the differences between JFETs and MOSFETs. **(06 Marks)**

c. Briefly discuss the working principles of CMOS. **(06 Marks)**

OR

2 a. Explain with a neat diagram current to voltage and voltage to current converter (using opamp) **(06 Marks)**

b. Explain the performance parameter of opamp. **(08 Marks)**

c. With necessary circuit diagram and waveforms, explain the operation of a relaxation oscillator using opamp. **(06 Marks)**

Module-2

3 a. Give simplified logic equation of $y = \sum m(0,1,2,3,10,11,12,13,14,15)$ using Quine-Mc clusky method. **(10 Marks)**

b. Find the minimal sum and minimal product using K-map.
$f(a,b,c,d) = \sum m(6,7,9,10,13) + d(1,4,5,11)$ **(08 Marks)**

c. Implement the following using NAND gates only. **(02 Marks)**

OR

4 a. Draw the timing diagram and write a verilog HDL code (using structural model) for the Boolean function Y = NAND (y_1, y_2) where $y_1 = A + B$ and $y_2 = B + C$. **(08 Marks)**

b. Write the truth table of the logic circuit having three inputs A, B and C and the output expression as $y = \overline{A}BC + ABC$. Also simplify the expression using Boolean algebra and implement the logic circuit using NAND gates. **(06 Marks)**

c. Realize basic gates using only NAND gates and only NOR gates. **(06 Marks)**

Module-3

5 a. Implement the following Boolean function using 4 : 1 MUX.
$F(A, B, C, D) = \sum m(0,1,2,4,6,9,12,14)$ **(06 Marks)**

b. Construct 16 : 1 MUX using 4 to 1 and 2 to 1 MUX. **(06 Marks)**

c. What is magnitude comparator? Design and explain 2-bit magnitude comparator. **(08 Marks)**

OR

6 a. Explain the positive edge-triggered JK flip flop with necessary logic diagram, truth table and waveforms. **(08 Marks)**

b. Illustrate the three basic circuits used in arithmetic building blocks. **(06 Marks)**

c. Design a 4 to 1 MUX, using conditional assign and case statements. **(06 Marks)**

Module-4

7 a. Briefly discuss the various representations of flip flops. **(12 Marks)**

b. Explain parallel-in-serial out shift register with example. **(08 Marks)**

OR

8 a. With block diagram, truth table and output waveforms, explain the 3-bit binary ripple down counter. **(10 Marks)**

b. Design synchronous mod-5 up counter using JK flip flops. **(10 Marks)**

Module-5

9 a. Design and construct divide by 60 counter. **(10 Marks)**

b. Design a self-correcting modulo-6 counter in which all unused state leads to state CBA = 000. **(10 Marks)**

OR

10 a. With n7ecessary circuit diagram and waveform, explain continuous analog-to-digital converter. **(10 Marks)**

b. Explain 4-bit digital to analog converter. **(10 Marks)**

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15CS42

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Software Engineering

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. What are the attributes of good software? **(04 Marks)**

b. Construct and explain the water fall model of software development process. **(05 Marks)**

c. Write a note on requirement elicitation and analysis. **(07 Marks)**

OR

2 a. What are the professional and ethical responsibility of software engineering. **(04 Marks)**

b. Explain insulin pump system by constructing its activity model. **(06 Marks)**

c. Briefly describe the different types of non-functional requirements. **(06 Marks)**

Module-2

3 a. List out the different types of UML diagrams. And explain process model of involuntary detention in MHC-PMS by constructing activity diagram. **(08 Marks)**

b. Determine the state diagram for the weather station system. Explain how it responds to request for various services. **(08 Marks)**

OR

4 a. What are the different implementation issues in software Engineering? **(08 Marks)**

b. Construct the class diagram for MHC-PMS which represents classes and association between the classes. Also explain the generalization and aggregation techniques. **(08 Marks)**

Module-3

5 a. What are the different types of interfaces between program components and interface errors? **(08 Marks)**

b. Analyze the benefits of reengineering over replacement. With a block diagram describe the activities in the reengineering process. **(08 Marks)**

OR

6 a. List the advantages of software inspection over testing and show that how inspection and testing supports in validation and verification of the software process. **(08 Marks)**

b. Describe the factors used in environment assessment and application assessment. **(06 Marks)**

c. Construct the block diagram of the software evolution process. **(02 Marks)**

Module-4

7 a. What are the factors affecting software pricing. **(03 Marks)**

b. Construct and explain the UML activity diagram for the project planning. **(05 Marks)**

c. With necessary diagram, describe the phaser of software review process. **(08 Marks)**

OR

8 a. Illustrate how Agile planning is applied in "planning in XP" **(08 Marks)**

b. Write a note on inspection checklist. **(05 Marks)**

c. Listout the software quality attributes. **(03 Marks)**

Module-5

9 a. Explain Boehm's spiral model. **(08 Marks)**

b. Summarize the practices involved in extreme programming. **(08 Marks)**

OR

10 a. Describe how SCRUM process helps in Agile project management. **(08 Marks)**

b. List and explain the phases of Rational Unified process (RUP) **(08 Marks)**

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15CS43

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Design and Analysis of Algorithm

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. What is an Algorithm? Explain any six properties to specify an algoirhtm. **(07 Marks)**

b. If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then prove that $t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$ **(05 Marks)**

c. Design an Algorithm to find a largest of a given number and analyze its efficiency. **(04 Marks)**

OR

2 a. Define Asymptotic rotation, explain Big-Oh notation and show that $10n^3 + 5 \in O(n^3)$. **(07 Marks)**

b. Consider a recurrence relation T(n) = T(n – 1) + n, with initial condition T(0) = 0. Solvc it using subsituational method. **(04 Marks)**

c. Compare the order of growth of $\log_2(n)$ and $\sqrt{n}$ using limits. **(05 Marks)**

Module-2

3 a. Design Binary search algorithm and derive its time complexity by applying Master Theorem. **(07 Marks)**

b. Apply quick sort to sort the list E, X, A, M, P, L, E and draw the recursive calls tree. **(06 Marks)**

c. Derive Strassen's matrix multiplication time complexity by applying substitutional method. **(03 Marks)**

4 a. Design Merge sort algorithm. Apply it to sort the list of elements 70, 20, 30, 40, 10, 50, 60. **(07 Marks)**

b. Write two advantages and disadvantages of Divide and conquer. **(04 Marks)**

c. Apply source removal algorithm to solve topological sorting problem for the following graph. (Ref. Fig Q No.4 (c)).

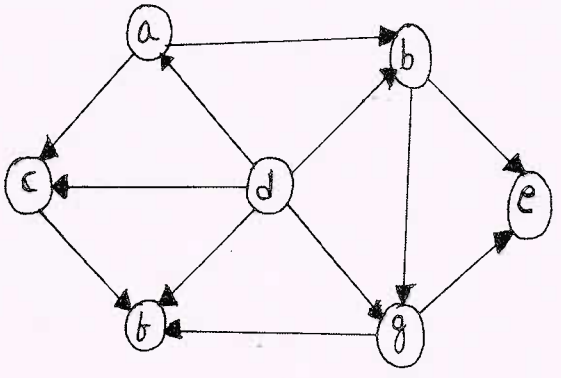

Fig Q4(c) **(05 Marks)**

Module-3

5 a. Define Greedy technique, feasible solution and optimal solution. Write general algorithm of greedy method. **(05 Marks)**

b. What is Knapsack problem? Find a feasible solution considering maximum profit, minimum weight and profit by weight ration to the Knapsack instance n = 7, m = 5, (P_1, P_2, P_3, P_4, P_5, P_6, P_7) = (10, 5, 15, 7, 6, 18, 3) and (w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1) **(05 Marks)**

c. i) Construct a Huffman tree for the following data and obtain in Huffman code.

Character	A	B	C	D	E	_
Probability	0.5	0.35	0.5	0.1	0.4	0.2

ii) Encode the text DAD_BE using the code of Question (i)

iii) Decode the text whose encoding is 1100110110 in the code of question (i) **(06 Marks)**

OR

6 a. Define a Heap and list the important properties of Heap. **(03 Marks)**

b. Compute a minimum cost spanning tree for the graph shown below in Fig Q6(b). Using i) Prim's and ii) Kruskal algorithm.

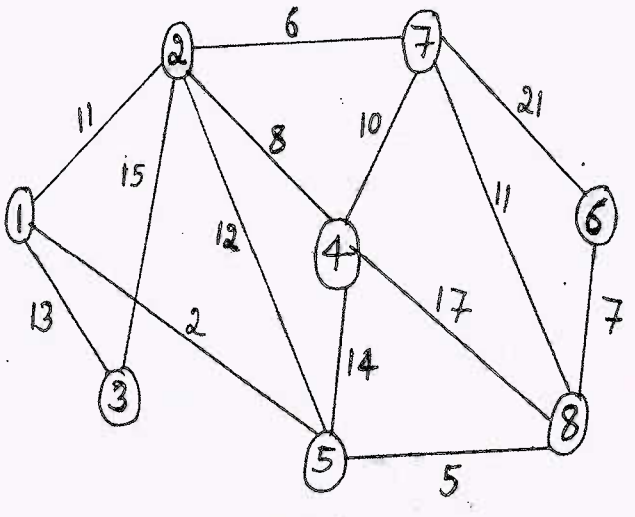

Fig Q6(b) **(08 Marks)**

c. Solve the following instances of the single source shortest paths problems with vertex a as the source. (Ref Fig Q No 6(c)).

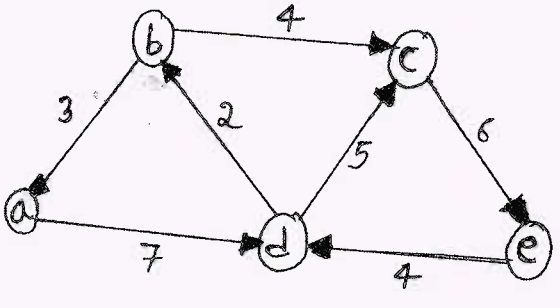

Fig Q6(c) **(05 Marks)**

Module-4

7 a. Design Warshall Algorithm. Apply Warshalls to find the transitive closure of the graph defined by the following adjacency matrix.

	a	b	c	d
a	0	1	0	0
b	0	0	0	1
c	0	0	0	0
d	1	0	1	0

(08 Marks)

b. Design Floyd's Algorithm, write one difference between FLOYD's and Dijkstra's algorithm. Apply Floyd's algorithm to the following graph. Ref Fig Q7(b)).

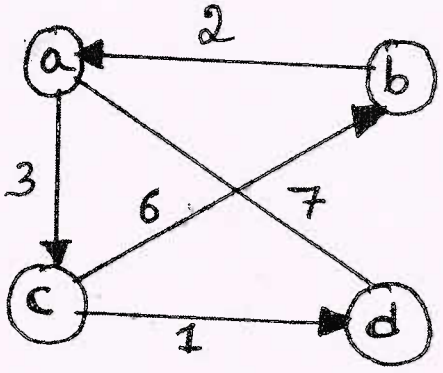

Fig Q7(b) **(08 Marks)**

OR

8 a. Write the recurrence relation to find the optimal solution for the Knapsack problem using Dynamic programming and find the optimal solution for the following instance.

Item	Weight	Value
1	2	$12
2	1	$10
3	3	$20
4	2	$15
Capacity w = 5		

(08 Marks)

b. Find shortest path from node 1 to every other node in the graph as given below in Fig Q8(b). Using Bellamn Ford Algorithm.

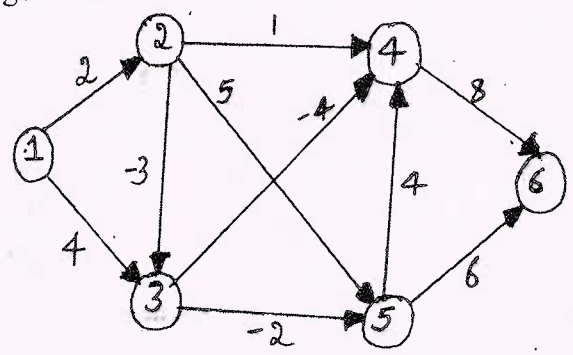

Fig Q8(b) **(08 Marks)**

Module-5

9 a. Design and implement in Java to find a subset of a given set S = {S_1, S_2, S_3.....S_n} of n positive integers whose sum is equal to a given positive integer d. **(08 Marks)**

b. Explain Backtracking concept and generate atleast 4 solutions for 5 Queen's problem. **(08 Marks)**

OR

10 Explain the following :

a. NP problems

b. NP – Complete problems

c. Graph coloring

d. Hamilton cycles. **(16 Marks)**

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15CS44

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Microprocessors and Microcontrollers

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With a neat diagram, explain architecture of 8086-Microprocessor. **(08 Marks)**

b. Explain the following addressing modes
   i) Immediate addressing mode
   ii) Register addressing mode
   iii) Direct memory addressing mode
   iv) Base relative addressing mode. **(08 Marks)**

OR

2 a. What is assembler directives? Explain any three assembler directives. **(08 Marks)**

b. If DS = 5000H and the offset is 1950H. Calculate:
   i) Physical address
   ii) Logical address
   iii) Lower range of the data segment
   iv) Upper range of the data segment. **(04 Marks)**

c. Write assembly language program to add 4 bytes of data stored in data segment. **(04 Marks)**

Module-2

3 a. Explain the following instructions with an example:
   i) INC ii) DAA iii) CMP iv) MUL. **(08 Marks)**

b. Write an ALP to sort a given set of 16 bit numbers in ascending order using Bubble sort. **(08 Marks)**

OR

4 a. Explain with example shift and rotate instructions. **(08 Marks)**

b. Write a code to perform the following:
   i) Clear the screen
   ii) To set the cursor
   iii) To display simple message 'welcome to microprocessor'. **(08 Marks)**

Module-3

5 a. Explain the syntax of the following instructions with example:
   i) STOSB ii) CMPSB iii) CBW iv) XLAT. **(08 Marks)**

b. Explain 74138 decoder configuration to enable the memory address F0000H to F3FFFH to 16 × 8 ROM **(08 Marks)**

OR

6 a. Write an assembly language program to move string of data from one memory location STR_1 to another memory location STR_2. **(06 Marks)**

b. For the given set of hexadecimal data find the checksum byte
34H, 54H, 7FH, 11H, E6H, 99H **(04 Marks)**

c. i) Find the control word port A as input, port B as output, port C as output. Use port addresses of 310H to 313H for the 8255 chip.
ii) Program the ports to input data from port A and send it to both port B and C. **(06 Marks)**

Module-4

7 a. Explain briefly the embedded system hardware components. **(06 Marks)**

b. Explain the registers of the ARM core processor. **(06 Marks)**

c. Differentiate between RISC and CISC processor. **(04 Marks)**

OR

8 a. Explain ARM core data flow model with a neat diagram. **(08 Marks)**

b. Explain the condition flags of ARM processor. **(04 Marks)**

c. Explain the concept of pipeline in ARM processor. **(04 Marks)**

Module-5

9 a. Explain the following instructions: i) LSL ii) RSB iii) ORR iv) MLA **(08 Marks)**

b. Write an assembly language program to using ARM instructions to copy a block of data to another block. **(08 Marks)**

OR

10 a. Explain software interrupt instruction of ARM processor. **(06 Marks)**

b. Explain Branch instruction of ARM controller. **(04 Marks)**

c. Explain various types of multiply instructions with example. **(06 Marks)**

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15CS45

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Object Oriented Concepts

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. List out the differences between object oriented programming and procedure oriented programming. **(06 Marks)**

b. Explain the following with example :
i) Console I/O
ii) Reference variable
iii) Function prototyping. **(04 Marks)**

c. Write a C++ program with class student with data members : name, usn, marks, perc and member functions : readDetails( ), printDetails( ), calcPercentage( ) and read 50 student details and print all details. **(06 Marks)**

OR

2 a. Compare C and C++ and list the differences. **(04 Marks)**

b. Write a C++ program to overload a function volume( ) to calculate volume of a box, cylinder and cube. **(06 Marks)**

c. Define a class A with data members : int a, float b and int *ptr. Define a constructor to initialize a, b and ptr to point to a dynamically allocated variable and define a destructor to deallocate the dynamically allocated variable and deinitialize a, b and ptr. **(06 Marks)**

Module-2

3 a. Explain the java buzzwords. **(06 Marks)**

b. Explain declaration and initialization of one dimensional and two dimensional arrays in java with examples. **(04 Marks)**

c. Write a java program with a class employee with data members : name, id, basic and net. And methods : read( ) calcnet( ) – to calculate net salary and print details( ). **(06 Marks)**

OR

4 a. Explain data abstraction and the pillars of OOP. **(06 Marks)**

b. Write a java program to print all prime number from 2 to 100. **(06 Marks)**

c. Write for each loop to calculate sum of 10 integers and print. **(04 Marks)**

Module-3

5 a. Explain the following with an example :
i) Use of "this" keyword in java
ii) finalize( ) method. **(04 Marks)**

b. With example explain two uses of "super" keyword. **(06 Marks)**

c. Explain how to define a package and import a package in to a program. **(06 Marks)**

OR

6 a. Define a class box with data members : width, height and length and define three overloaded constructions to :
   i) Pass values for all 3 members
   ii) Initialize all members to -- 1
   iii) Assign same value to all three. **(06 Marks)**

b. Illustrate order of calling the constructors in a multilevel inheritance hierarchy. **(04 Marks)**

c. Explain the exception handling keywords in java with example. **(06 Marks)**

Module-4

7 a. With an example explain how to create a new thread using runnable interface. **(06 Marks)**

b. Explain hour one thread can wait for another thread to finish using is Alive( ) and join( ) methods. **(04 Marks)**

c. Explain the MouseListener and WindowListener interfaces with methods and their prototype. **(06 Marks)**

OR

8 a. With an example explain how to create a new thread using thread class. **(06 Marks)**

b. Write a program for producer -- consumer problem using wait( ), notify( ) and notifyall( ) methods. **(06 Marks)**

c. Write a program to handle any three keyboard events. **(04 Marks)**

Module-5

9 a. Explain the methods and their use of the Applet class. **(04 Marks)**

b. Write an Applet program to display font name and font size by passing parameters to an Applet. **(06 Marks)**

c. Create a swing Applet with two buttons "OK" and "EXIT" and display a message which button is pressed. **(06 Marks)**

OR

10 a. Explain the Applet tags with example. **(04 Marks)**

b. Write an Applet program to create a Banner Applet that displays "Java makes the web move!". **(06 Marks)**

c. Explain the usage of JLabel, ImageIcon and JButton swing components. **(06 Marks)**

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15CS46

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Data Communications

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is data communication? Discuss different criterias necessary for an effective and efficient network. **(04 Marks)**

b. Assume eight devices are arranged in a mesh topology how many cables are needed? How many ports are needed for each device? **(02 Marks)**

c. Explain the layers in TCP/IP protocol suit. **(08 Marks)**

d. If a peak voltage of a signal is 20 times the peak voltage of the noise what is SNR and SNR_{dB}. **(02 Marks)**

OR

2 a. Explain different causes for transmission impairment. **(06 Marks)**

b. Draw the graph of NRZ-L, NRZ-I and Bipolar schemes using the following data stream 0101100. **(04 Marks)**

c. Bringout the major difference between TCP/IP and OSI model. **(03 Marks)**

d. What is the total delay for a frame of size 5 million bits that is being sort on a link with 10 routers each having a queuing time of 2μs and processing time of 1μs. The length of the link is 2000km, the speed of the light inside the link is 2×10^8m/s. The link has a bandwidth of 5Mbps. **(03 Marks)**

Module-2

3 a. With a neat diagram, explain the most common technique to change analog signal to digital data. **(09 Marks)**

b. In a digital transmission the sender clock is 0.3 percent faster than the receiver clock. How many extrabits per second does the sender send if the data rate is 1 Mbps. **(03 Marks)**

c. Explain different aspects of analog to digital conversion. **(04 Marks)**

OR

4 a. List out basic multiplexing techniques. Explain any one in detail. **(05 Marks)**

b. Explain the concept of Direct sequence spread spectrum. **(04 Marks)**

c. With neat diagram, explain virtual circuit networks. **(05 Marks)**

d. We have an available bandwidth of 100kHz which spans from 200 to 300kHz. What should be carrier frequency and the bit rate if we modulated our data by using FSK with d = 1? **(02 Marks)**

Module-3

5 a. Given dataword 101001111 and devisor 10111, show the generation of CRC codeword at the sender site. **(06 Marks)**

b. Bit stuff the following frame payload 000111110000111110100011111101111000111 **(03 Marks)**

c. With neat diagram, explain point-to-point protocol frame format. **(05 Marks)**

d. Prove that the code represented by the following codewords is not linear: [(00000), (01011), (10111), (11111)] **(02 Marks)**

OR

6 a. Explain flow diagram for stop and wait protocol. **(05 Marks)**

b. With neat diagram explain different frame types available in HDLC. **(06 Marks)**

c. Assume a packet is made any of four 16 bit words $(466F)_{16}$, $(726F)_{16}$, $(757A)_{16}$ and $(616E)_{16}$. Find the sender site check sum using traditional checksum algorithm. **(05 Marks)**

Module-4

7 a. Explain different persistence methods. **(06 Marks)**

b. What are orthogal sequences give their properties. **(03 Marks)**

c. We have pure ALOHA network with 100 stations. If T_{fr} is 1μs. What is the number of frames each station can send to achieve the maximum efficiency? **(02 Marks)**

d. Explain Ethernet frame format. **(05 Marks)**

OR

8 a. Discuss hidden station problem. **(06 Marks)**

b. Explain with a neat diagram MAC layer frame format. **(06 Marks)**

c. What is Bluetooth, explain any one Bluetooth network. **(04 Marks)**

Module-5

9 a. Draw a cell pattern with frequency reuse factor of 5. **(02 Marks)**

b. What is WIMAX discuss different services it provides to the subscribers. **(07 Marks)**

c. An organization is assigned the block 2000:1456:2474/48. What is the CIDR notation for the block in the first and second subnet in this organization? **(02 Marks)**

d. List major strategies involved in transition from IPV4 to IPV6, explain any two in detail. **(05 Marks)**

OR

10 a. Explain IPV4 datagram format. **(08 Marks)**

b. With the help of flow diagram discuss how mobile host and remote host communicates in mobile I_p. **(06 Marks)**

c. According to Kepleri law, what is the period of satellite that is located at an orbit approximately 35,786km? **(02 Marks)**

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15CS32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Analog and Digital Electronics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain the construction and principles of operation of JFET. **(08 Marks)**

b. Explain with neat sketches, the operation and parameter of n-channel depletion type MOSFET. **(08 Marks)**

OR

2 a. Discuss characteristics of an ideal op-amp and compare with practical op-amp. **(08 Marks)**

b. For the circuit shown in Fig.Q2(b) determine the valve of drain source voltage (V_{DS}). Assume $V_{GS} = -0.8V$.

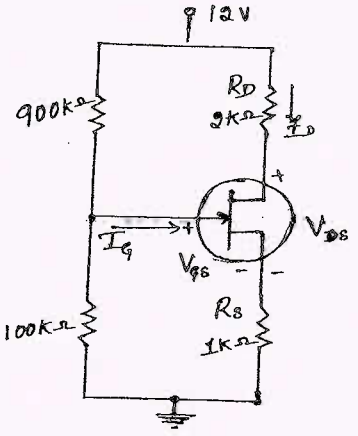


Fig.Q2(b) **(08 Marks)**

Module-2

3 a. What are universal gates? Draw the logic circuit for $y = (A + B + C)(A + B + C)$ using universal gates. **(05 Marks)**

b. Find the minimal SOP of the following Boolean function using K-Map.
$F(a, b, c, d) = \sum m(7, 9, 10, 11, 12, 13, 14, 15)$ **(05 Marks)**

c. Define Hazards? How to design a static 1 hazard free circuit? Explain with an example. **(06 Marks)**

OR

4 a. Simplify the expression $y = f(A, B, C, D) = \sum m (1, 2, 8, 9, 10, 12, 13, 14)$ using Quine – McClusky Method. **(10 Marks)**

b. What is the need of HDL? Write the verilog code for the circuit. Shown in Fig.Q4(b)

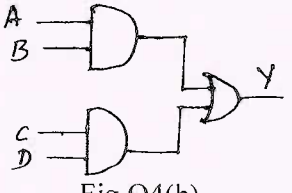


Fig.Q4(b) **(06 Marks)**

Module-3

5 a. What is multiplexer? Write the logic circuit and truth table of 4:1 multiplexer. **(05 Marks)**

b. Explain BCD to Decimal decoder along with circuit diagram. **(05 Marks)**

c. What is magnitude comparator? Design and explain 1 bit magnitude comparator. **(06 Marks)**

OR

6 a. Implement the following function using PLA
$A(x, y, z) = \sum m(1, 2, 4, 6)$
$B(x, y, z) = \sum m(0, 1, 6, 7)$
$C(x, y, z) = \sum m(2, 6)$ **(06 Marks)**

b. Implement the Boolean function expressed by
SOP $f(a, b, c, d) = \sum m(1, 3, 4, 5, 9, 11, 12)$ using 8:1 MUX. **(06 Marks)**

c. Write a note on parity Checker. **(04 Marks)**

Module-4

7 a. What is flip flop? Explain the working of JK master slave flip flop using NAND gates. **(08 Marks)**

b. Write the Execution table of SR, D, JK and T flip flop. **(04 Marks)**

c. Write the difference between synchronous and Asynchronous counter. **(04 Marks)**

OR

8 a. Using Positive edge triggered D flip flop, draw the logic diagram of 4bit SISO Register. Draw the timing diagram to shift binary number 1110 into Register. **(05 Marks)**

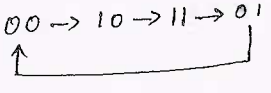
b. Explain with neat diagram 4 bit switched tail counter **(05 Marks)**

c. Explain how shift Register can be applied for sequence detector. **(06 Marks)**

Module-5

9 a. Explain a 3 bit binary Rippledown counter. Give block diagram, truth table and output waveforms. **(08 Marks)**

b. Design a sequences, a module – 4 Irregular counter with following counting sequence using D flip flop. **(08 Marks)**



OR

10 a. Explain 4 bit D/A converter. **(10 Marks)**

b. What is binary ladder? Explain the binary ladder with digital input of 1000. **(06 Marks)**

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15CS36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define tautology and contradiction. Prove that the compound proposition $[(p \to q) \vee (p \to r) \leftrightarrow [p \to (q \vee r)]$ is tautology. **(05 Marks)**

b. Test the validity of the argument

$p \to q$
$q \to (r \wedge s)$
$\neg r \vee (\neg t \vee u)$
$p \wedge t$
$\therefore u$

(05 Marks)

c. Give (i) direct proof, (ii) indirect proof and (iii) Proof by contradiction, for the statement "Square of an odd integer, is an odd integer". **(06 Marks)**

OR

2 a. Prove the following logical equivalence without using truth table.

$(p \to q) \wedge [\neg q \wedge (r \vee \neg q)] \leftrightarrow \neg(p \vee q)$ **(05 Marks)**

b. Establish the validity of the argument using the rules of inferences.

No engineering student of first or second semester studies Logic
Anil is an engineering student who studies logic.
$\therefore$ Anil is not in second semester. **(05 Marks)**

c. Let $p(x) : x^2 - 7x + 10 = 0$; $q(x) = x^2 - 2x - 3 = 0$; $r(x) = x < 0$

Determine the truth value of the following statements, if universe contains only the integers 2 and 5.

(i) $\forall x, p(x) \to \neg r(x)$ (ii) $\forall x, q(x) \to r(x)$
(iii) $\exists x, p(x) \to r(x)$ (iv) $\exists x, q(x) \to r(x)$ **(06 Marks)**

Module-2

3 a. Prove by mathematical induction for any integer $n \geq 1$.

$$\frac{1}{2.5} + \frac{1}{5.8} + \ldots\ldots\ldots + \frac{1}{(3n-1)(3n+2)} = \frac{n}{6n+4}$$ **(05 Marks)**

b. How many positive integers n can be formed using the digits 3, 4, 4, 5, 5, 6, 7 if we want n to exceed 50,00,000? **(05 Marks)**

c. Find the coefficient of

(i) x^{12} in the expansion of $(1 - 2x)^{10} x^3$
(ii) $x^{11}y^4$ in the expansion of $(2x^3 - 3xy^2 + z^2)^6$
(iii) the constant term in the expansion of $\left(3x^2 - \frac{2}{x}\right)^{15}$ **(06 Marks)**

OR

4 a. Let $a_0 = 1$, $a_1 = 2$, $a_2 = 3$ and $a_n = a_{n-1} + a_{n-2} + a_{n-3}$ for $n \geq 3$. Prove that $a_n \leq 3^n$ for all positive integer n. **(05 Marks)**

b. If $L_0, L_1, L_2, \ldots\ldots$ are Lucas numbers, then prove that

$$L_n = \left(\frac{1+\sqrt{5}}{2}\right)^n + \left(\frac{1-\sqrt{5}}{2}\right)^n$$ **(05 Marks)**

c. In how many ways can one distribute eight identical bulls into four distinct containers so that (i) no container is left empty? (ii) the fourth container contains an odd number of balls? **(06 Marks)**

Module-3

5 a. Let f, g, h be functions from R to R defined by $f(x) = x^2$, $g(x) = x + 5$, $h(x) = \sqrt{x^2 + 2}$, verify that $(h \circ g) \circ f = h \circ (g \circ f)$. **(05 Marks)**

b. Let $f : R \to R$ be defined by

$$f(x) = \begin{cases} 3x - 5 & \text{for } x > 0 \\ -3x + 1 & \text{for } x \leq 0 \end{cases}$$ then find

(i) f(–1) (ii) f(5/3) (iii) $f^{-1}(3)$ (iv) $f^{-1}(-6)$ (iv) $f^{-1}([-5, 5])$. **(05 Marks)**

c. Define partially ordered set. Draw the Hasse diagram representing the positive divisors of 36. **(06 Marks)**

OR

6 a. Determine the following relations are functions or not. If relation is function, find its range

(i) $\{(x, y)/x, y \in z, y = 3x+1\}$; (ii) $\{(x, y)/x, y \in z, y = x^2+3\}$;

(iii) $\{(x, y)/x, y \in R, y^2 = x\}$; (iv) $\{(x, y)/x, y \in Q, x^2+y^2=1\}$ **(05 Marks)**

b. State the Pigeonhole principle and generalization of the pigeonhole principle. Prove that if 30 dictionaries in a library contains a total of 61,327 pages, then at least one of the dictionaries must have at least 2045 pages. **(05 Marks)**

c. Let A = {1, 2, 3, 4, 6} and R be a relation on A defined by aRb if and only if a is a multiple of b. Represent the relation R as matrix and draw its digraph. **(06 Marks)**

Module-4

7 a. Determine the number of positive integers n, such that $1 \leq n \leq 300$, and n is

(i) not divisible by 5, 6, 8

(ii) divisible by at least one of 5, 6, 8 **(05 Marks)**

b. Four persons P_1, P_2, P_3, P_4 who arrive late for a dinner party, find that only one chair at each of five tables T_1, T_2, T_3, T_4, T_5 is vacant. P_1 will not sit T_1 or T_2, P_2 will not sit at T_2, P_3 will not sit at T_3 or T_4 and P_4 will not sit at T_4 or T_5. Find the number of way they can occupy the vacant chairs. **(05 Marks)**

c. Solve the recurrence relation:

$a_{n+1} = 3a_n + 5 \times 7^{n+1}$ for $n \geq 0$, give that $a_0 = 2$. **(06 Marks)**

OR

8 a. Find the number of permutations of the digits 1 through 9 in which the blocks 36, 78, 672 do not appear. **(06 Marks)**

b. Find the rook polynomial for the board in the Fig.Q8(b). Using expansion formula and product formula. **(06 Marks)**

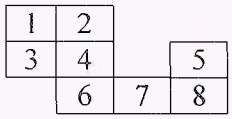

Fig.Q8(b)

c. If $a_0 = 0$, $a_1 = 1$, $a_2 = 4$ and $a_3 = 37$, satisfy the recurrence relation

$a_{n+2} + ba_{n+1} + ca_n = 0$ for $n \geq 0$,

determine the constants b and c and then solve the relation for a_n. **(04 Marks)**

Module-5

9 a. Define complete graph and complete bipartite graph. Hence draw
(i) Kuratowaski's first graph K_5,
(ii) Kuratowaski's second graph K_{33}
(iii) 3-regular graph with 8 vertices. **(05 Marks)**

b. Discuss the solution of Kongsberg bridge problem. **(05 Marks)**

c. Obtain an optimal prefix code for the message LETTER RECEIVED. Indicate the code. **(06 Marks)**

OR

10 a. State Handshaking property, how many vertices will a graphs have, if they contain
(i) 16 edges and all vertices of degree 4?
(ii) 21 edges, 3 vertices of degree 4 and other vertices of degree 3?
(iii) 12 edges, 6 vertices of degree 3 and other vertices of degree less than 3. **(05 Marks)**

b. Define isomorphism of two graphs. Show that following pair of graphs are isomorphic. [Refer Fig.Q10(b)].

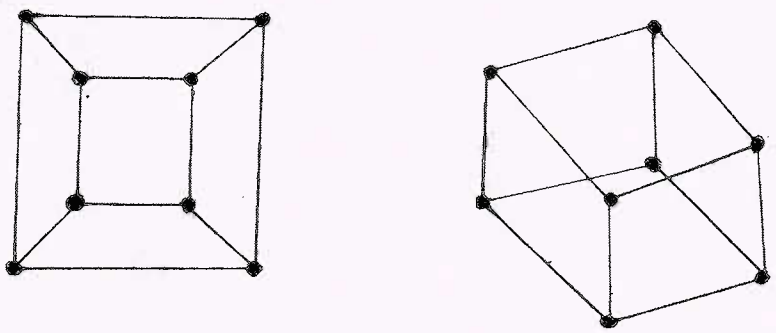

Fig.Q10(b) **(05 Marks)**

c. Define tree and prove that tree with n vertices has $n - 1$ edges. **(06 Marks)**

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